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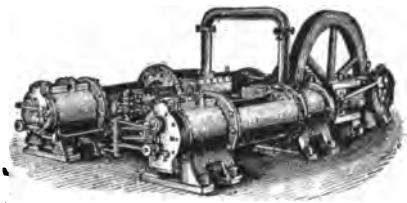

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Engineering Periodicals,

FROM **1888** TO **1892**, INCLUSIVE.

COMPRISING

ENGINEERING; RAILROADS; SCIENCE; MANUFACTURES AND TRADE.

BY

FRANCIS E. GALLOUPE, M.E.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, S.B.; MEMBER AMERICAN SOCIETY OF MECHANICAL ENGINEERS, ETC.

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FROM THE PREFACE TO THE FIRST VOLUME.

PROGRESS in the development of material resources, in recent years, has created a large and increasing volume of engineering literature in periodicals which contain valuable papers and information, much of which is too recent, or fragmentary in character, to be found in books, or elsewhere.

This work is designed to make accessible to engineers in all branches of the profession, to special investigators, librarians, editors and others, the more important papers and articles contained in leading American and English periodicals during the last five years. To keep the list from becoming unwieldy, it was decided to limit, besides the period covered, the number of periodicals, and with these restrictions the compiler has selected each reference given by personal examination of the articles in the files.

The index is by subjects, alphabetically arranged, and makes available information now practically buried in the mass of engineering literature, or only to be extracted by the aid of some one hundred and fifty indices, and the loss of much time.

BOSTON, *May*, 1888.

PREFACE.

THE purpose of this Index is to supply a reference list to the important works and matters relating to engineering and its allied interests, during the period covered. It is believed that no other index fills the field of this work, which shows at a glance the principal information published on any given subject in the leading periodicals during the past five years. The periodicals indexed having been selected from a list of over one hundred and sixty periodicals will, it is thought, sufficiently cover the field of practical engineering, as nearly all important works and matters are contained among these representative papers. Foreign papers are represented by translated articles reprinted in the periodicals indexed, and there are besides incidental references to numerous others.

Within the limits set, the aim has been, by a critical examination of each article throughout the files, to preserve references to all those of permanent technical value, or practical use.

BOSTON, *June*, 1893.

ABBREVIATIONS.

addr. address.
agric. agricultural.
Am. American.
amt. amount.
anal. analysis.
ap. apparatus.
aqued. aqueduct.
atmos. atmosphere.
aut. automatic.
bat. battery.
Bess. Bessemer.
Brit. British.
bull. bulletin.
cal. calculating, calculation.
capac. capacity.
cath. cathedral.
C. E. civil engineer.
Cens. Census.
centrif. centrifugal.
chem. chemistry.
condens. condensing, condensation.
cor. correspondence
corrug. corrugated.
Corp. Corporation.
Co's. Companies.
cyl. cylinder.
dec. decrease.
dept. department.
des. designer, design.
desc. description.
diam. diameter,
discov. discovery.
discuss. discussion.
distil. distillation.
distrib. distribution.
dyn. dynamometer.
econ. economy, economical.
effic. efficiency.
elec. electric.
eng. engineering.
es. estimate.
estab. establishment.
evap. evaporation.
exam. examination.
excav. excavating, excavation.
exhib. exhibition.
exp. expense.
expt. experiment.
frt. freight.
galv. galvanometer.
gov. governor.
h. house.
h. p. horse power.
hist. history.
hor. horizontal.
hos. hospital.
ht. height.
hydr. hydraulic.
illum. illuminating.
imp. improvement.
inc. increase.
incand. incandescent.
indus. industry, industrial.

ins. insurance.
Inst. Institute.
inv. inventor, invention.
locom. locomotive.
M. E. mechanical engineer.
mach. machine, machinery.
manuf. manufacture.
max. maximum.
min. minute.
mo. motive.
mt. mountain.
munic. municipal.
mut. mutual.
n. note.
nav. navigation.
obs. observations.
pass. passenger.
pat. patent.
pneu. pneumatic.
pop. population.
por. portrait.
pph. pamphlet.
pro. proceedings.
proc. process.
prog. progress.
pyrom. pyrometer.
R. railroad.
recip. reciprocating.
refrig. refrigerating.
rep. report.
resist. resistance.
Ry. railway.
san. sanitary.
sec. second.
Soc. Society.
spec. specification.
sq. square.
st. street.
stat. statistics.
str. steamer.
sup. supplement.
teleg. telegraph.
teleph. telephone.
temp. temperature.
topog. topographical.
util. utilization.
vac. vacuum.
vel. velocity.
ventil. ventilation.
wrt. wrought.
wt. weight.

NAMES OF PERIODICALS INDEXED,

WITH THEIR ABBREVIATIONS.

Cassier's Magazine. *Cassier's*
Electrical Engineer, N. Y. *El Eng*
Electrical Review, London. *El Rev Lond*
Electrical Review, N. Y. *El Rev*
Electrical World, N. Y. *El Wld*
Engineer, The, London. *The Eng*
Engineering, London. *Eng*
Engineering Magazine, N. Y. *E Mag*
Engineering and Mining Journal, N. Y. *E & Min*
Engineering News, N. Y. *E News*
Engineering Record, N. Y. *E Rec*
Journal of the Franklin Institute, Phila. *F Inst*
Power, N. Y. *Pwr*
Proceedings of the Institution of Civil Engineers, London. *Inst C E*
Proceedings of the Institution of Mechanical Engineers, London. *Inst M E*
Proceedings of the Society of Arts, Boston. *Soc Arts Mass*
Railroad and Engineering Journal, N. Y. *R & Eng*
Railroad Gazette, N. Y. *R Gaz*
Scientific American Supplement, N. Y. *Sc Am Sup*
Street Railway Journal, N. Y. *St R J*
Technology Quarterly, Boston. *Tech Q*
Transactions American Institute of Mining Engineers, N. Y. *Am Min*
Transactions American Society of Civil Engineers, N. Y. *Am C E*
Transactions American Society of Mechanical Engineers, N. Y. *Am M E*

OTHER PERIODICALS INCIDENTALLY INDEXED IN PART.

American Engineer; Annales des Ponts; Building News, London; Century Magazine; Cosmopolitan Magazine; Forum; Le Genie Civil; Harper's Monthly; Industries; Iron Age; Journal of the Assoc. of Eng. Societies; The Locomotive; New England Magazine; Nineteenth Century; North American Review; Scribner's Magazine, etc.

PRINCIPAL SUBJECTS

INCLUDED IN THE INDEX.

PAGE

Agriculture 1
Air 2
Air navigation 3
Alloys 4
Aluminum 5
Arches 8
Architecture 9
Astronomy 12

Beams and girders 15
Belts 16
Blast furnaces 17
Blowers and fans 19
Blue print processes 20
Boilers 20
Brick 27
Bridges 27
Buildings and building . . . 45

Cable railroads 50
Canals 53
Capital and labor 57
Cars and carriages 57
Cast iron 65
Cements and mortars 66
Chemistry 69
Chimneys 73
Cities 74
Coal 75
Columns 79
Copper 81
Cranes and derricks 84
Crossties 85

Dams 87
Docks 91
Drainage 92
Drawing 93
Dredgers 93

PAGE

Dynamometers 95
Dynamos 95

Education 100
Electric engineering 101
Electric batteries 102
Electric companies 103
Electric conductors 105
Electric currents 105
Electric distribution 109
Electric engineers 110
Electric generators 111
Electric heating 112
Electric induction 113
Electric insulation 114
Electric lamps, arc 115
Electric lamps, incand. 115
Electric lighting 116
Electric lighting stations . . 121
Electric meters 124
Electric motors 125
Electric power 128
Electric power transmission 129
Electric resistance 130
Electric transformers 133
Electric units 134
Electric welding 135
Electric wires 137
Electricity 138
Elevators 141
Engineering 143
Engineering, civil 144
Engineering, mechanical . 144
Engineers 145
Engines 147
Engines, tests 153
Excavating 155
Exhibitions 155
Explosives 157

PAGE
Ferry-boats 159
Fire protection 161
Flying 163
Foundations 164
Foundry 165
Friction 166
Fuels 166
Furnaces 167

Gas 169
Gas engines 169
Gearing 172
Gold 174
Great Britain 177
Gunnery and armor 178
Guns 179

Harbor engineering 182
Heat 187
Heating and ventilation . . . 188
Hoisting 189
Hydraulic engineering 191

Indexes 192
Instruments 194
Inventions 194
Iron and steel 195
Irrigation 200

Labor 203
Lakes 204
Light 207
Light-houses 208
Lightning 209
Locomotives 210
Lubrication 226

Machine 226
Magnetism 227
Maps 229
Marine engineering 229
Marine boilers 229
Marine engines 231
Materials 235
Metals 237
Metallurgy 237
Military engineering 239
Mills and factories 240
Minerals 240
Mines and mining eng. . . . 241

PAGE
Mining engineers 245
Municipal engineering 247

Navies 248
New York city 252
Niagara Falls 253
Nickel 253

Oils 254
Ore 255

Paper 257
Patents 258
Pavements 258
Petroleum 260
Petrol. engines 261
Phonograph 262
Phosphates 262
Photography 262
Physics 264
Piles 265
Pipes 266
Plumbing 267
Power transmission 268
Pumping engines 270
Pumps 272

Quarrying 273

Railroads 274
Railroad accidents 275
Railroad brakes 278
Railroad construction 281
Railroad curves 282
Railroads, electric 283
Railroads, electric motors . . 289
R's. electric, power stations 289
Railroads, elevated 291
Railroad location 296
Railroads, mountain 297
Railroad signals 303
Railroad speeds 305
Railroad stations 306
Railroad switches 308
Railroad train resistance . . 310
Railroads, underground . . . 311
Railroads, U. S. 312
Rails 313
Rail joints 315
Rail sections 315

PAGE
Rainfall 316
Rapid transit 317
Refrigerating 318
Reservoirs 318
Rivers 320
Roads 323
Roofs 325
Rope driving 326
Rotary engines 326

Sanitary engineering 328
Schools 328
Science 329
Screw propellers 329
Sewerage 330
Ship-building 335
Ships 335
Silver 336
Smoke prevention 338
Standpipes 341
Steam 341
Steam heating 343
Steam pipes 344
Steamers 345
Steel 348
Stone 351
Storage batteries 351
Street railroads 353
St. railroads motive power . 355
Streets 356
Sugar 357
Sun 358
Surveying 358

PAGE
Telegraph 360
Telephone 363
Telpherage 365
Testing 366
Timber 367
Time 368
Tin 368
Torpedo boats 369
Towers 369
Track 370
Trestles 372
Tubes 373
Tunnels 373
Turbines 376

United States 377

Valves 378

Water 380
Water filters 382
Water meters 383
Water pipes 383
Water power 384
Water purification 384
Waterworks and supply . . . 385
Waves 391
Weights and measures . . . 392
Wells 392
Wind 393
Wire rope 394
Wood 394

Yachts 395

ENGINEERING INDEX

NOTE. — The black-faced figures refer to the years, as -90 = 1890, and *follow* the references.

When, in dates of months, the same figures are repeated, as "Aug. 24, 24" the article is to be looked for in two or more places in the same issue.

The * indicates illustrated articles.

Aaron, Charles H. n por *E & Min* * June 6-**91**

Abbott, Samuel *Inst C E* v 102-**90**

Abel, Frederick A. por *E & Min* * June 7-**90**

Abrasion, expts. (sand blast), Thoulet *Inst C E* v 91-**88,** abs *An Mines* v 7-**87;** abrasive processes in the mechanic arts, Richards, *E & Min* July 25, Aug 15-**91**

Accidents, accident-preventing devices applied to machines, Cooper *Am M E* * v 12-**91.** See also BRIDGES—MINE—RAILROAD accidents

Accumulators, electric. See STORAGE Batteries

Actinism and electrolysis, Houston *F Inst* Dec -**91**

Adamson, Daniel *Eng* Jan 17-**90**; *Inst C E* v 100-**90**; *Inst M E* Jan -**90**; *The Eng* Jan 17-**90**

Addison, John C. *Inst C E* v 91-**88**

Advertising, newspaper, Richards *El Rev* Aug 22, Sullivan Sep 12 etc. -**91**

Aerial engineering, ed *E & Min* July 28-**88**; navigation, see AIR navigation

Aerodromics, expts. in aerodynamics, Langley *R Gaz* Sep 18-**91,** Smithsonian Contribs. Wash. -**91,** abs *Inst C E* v 107-**92**

Aeronautics. See AIR navigation; BALLOONS; FLYING

Africa and the European powers, map *E News* * Nov 21-**91**; South Africa, notes, France *Eng* July 20-**88,** cor Mar 21-**90.** See also DIAMOND mines; GOLD-fields, So Africa

Agriculture, electric applics. *El Wld* * Dec -**92**; the electric motor and the farmer, Black *E Mag* Nov -**92**; in the desert *Eng* * Dec 13-**89,** maps *Sc Am Sup* * Jan 25-**90**; engineering in India *Eng* Apr 6, * May 4, 18, * June 8, 22, * July 6, * Aug 3, 24, * Sep 7, 28, * Oct 19, * Nov 16-**88**; lines of progress in, Miles *Pop Sci* July -**88**

Agricultural machinery, sheaf-binder, Howard's *The Eng* Dec 7-**88**; Royal Societies' Show *Eng* * July 13, Smithfield Club * Dec 14-**88**, Winsor * June 28, *The Eng* * June 21, 28, July 5, 12-**89**, Plymouth *Eng* * June 27-**90**, Doncaster * June 26-**91**, Warwick, June 24, *The Eng* * June 24, * July 1-**92**

Air currents, movement of upper, Hazen *F Inst* July -**88**; ozone formation etc. and presence in *Sc Am Sup* Apr 19-**90**; biological exam. of, new method, Sedgwick, Tucker *Soc Arts Mass* -**88**; organic matter in, determination, Talbot *Tech Q* * Sep -**87**; flow of in a diverging conical trunk, driven by fan, Lodge, cor. *The Eng* Jan 4, 18, energy in a pound of, Cherry, n cor. 18, induced currents, ed. * Feb. 15-**89**. See also ATMOSPHERE

COMPRESSED, motors for tramways, N. Y., Jacobus *Am Min* * v 19-**91**; Saunders *Cassier's* * June -**92** *Eng* locomotives, Hardie, cor. June 8-**88**; Popp system in Paris Feb 15, do transmission of energy by * June 7, 21, 28, do Kennedy * Sep 13-**89**; low pressure, for tram cars, ed. Mar 14 * 21-**90**, Paris system * May 13, 20, April 10, * May 1; compound and motors, Elliott * Dec 4, 11-**91**; *E & Min* formulæ, Saunders, July 11, 'caisson disease', do 18, Aug 1-**91**

E News distribution in Paris, Popp system * Dec 14-28-**89**; Mekarski st. tramway motor * May 24, 31-**90**; graphic diagram of compression, Ingersoll Rock Drill Co. Oct 18, correction * 25-**90**; Saunders * Aug 25-**92**; do *F Inst* * May -**92**

E Rec power transmission by, C. Sellers Aug 13-**92**; *El Rev Lond* condensers, Brit. Assoc., Glazebrook (full) * Oct 3-**90**

Inst C E power transmission by, Unwin * v 93-**88**; do * v 105-**91**; Nogent tramways, Demoulin, abs. v 99-**90**, *Rev Gen Chemins* Sep -**89**

Sc Am Sup power transmission by, Popp system, Paris * Feb 9, do., Kennedy (full) * Oct 26-**89**, (full) Aug 30-**90**; production, Saunders (full) * Apr 25; Paris system (full) * May 23; use in nervous and mental affections, Corning (full) Oct 3, 10-**91**

The Eng steel receivers Nov 9-**88**; Popp system, Paris * May 3, do., expts., Kennedy Sep 20-**89**. See also STREET railroads, compressed air motive power

COMPRESSORS, compressing machinery, Paris exhib. *Eng* * Aug 2-**89**; air valve, Ingersoll Rock Drill Co. *E News* * Sep 27-**90**; * Aug 10; light portable * Oct 12-**89**; aut. regulators,

Air COMPRESSORS
Ingersoll Rock Drill Co. * Mar 28-**91** ; Atkinson's *The Eng* * July 3-**91**
ENGINES. See HOT air engines
NAVIGATION, *Cosmopolitan* mechanical flight, Langley, May, the aeroplane, Maxim, June -**92** ; *E Mag* prog., Chanute * Oct-**91**, suggestions, Kirk * Feb -**92** ; *E & Min* ed. July 28-**88** ; *E News* natural limitation of, J. B. Johnson, Dec 6-**90**, Mt. Carmel air-ship, ed. * Feb 21-**91** ; *E Rec* Chanute, Mar 14-**91** ; *Forum* problem of, Thurston, Jan -**90** ; *Inst C E* expts. in aerodynamics, Langley, abs. v 107-**92**, Smithsonian Contribs., Wash -**91**, *R & Eng* Chanute * July, * Aug, Sep, Philbrick, cor. n Sep, * Oct, Nov -**90** ; *R Gaz* Langley's expts Sep 18-**91** ; *Sc Am Sup* Helmer, n * Jan 17-**91** ; parachute, history * Dec 17-**92** ; *The Eng* reaction of air on planes, Lancaster, cor. * Mar 7-**90**. See also BALLOONS; FLYING machines
PIPES, friction of hot air in, cor *Eng* * Jan 6-**88** ; air vessels on pipes and pumps, M'Creath * July 5-**89**
PROPELLERS, the Blackman *Eng* Feb 24-**88** ; for ship propulsion, Vogt *Sc Am Sup* * Nov 3-**88** ; do *The Eng* Sep 28, Oct 12-**88**
PUMPS, mercurial, development, S. P. Thompson *El Eng* * Feb, * Apr, * May -**88** ; the Massey, Eames Vac. Brake Co. *R Gaz* * Dec 6-**89** ; mercurial, development, Thompson *Sc Am Sup* * Jan 21, 28-**88**, Sprengel, new form, Rawson * Oct 11-**90** ; mercurial, Wood * Jan 27-**91** ; horizontal, Longridge *The Eng* Sep 27-**89**
PURIFICATION by ozone, new method, Richardson *Sc Am Sup* Sep 28-**89**
RESISTANCE, experimental study of, Crosby *E News* June 7, 14, laws of, ed. * June 21, do. Hazen and ed. July 5, 5, correction and ed. 12, 12, Marvin, cor. 19, determination of, do. Sep 27-**90** ; at very high vels., Chanute, cor. *R Gaz* Dec 26-**90**. See also RAILROADS, train resistance
VALVE, Rand mechan. *E News* * May 11-**89**

Alabama and Tenn. *Eng* * Oct 5, * Nov 2-**88** ; iron and coal mines *Sc Am Sup* Sep 29-**88**

Alaska, Yosemite and the Yellowstone *Eng* * Dec 2—30-**92** ; wealth and resources, n *E News* Apr 4-**91**

Albert Victor, Duke of Clarence *Inst C E* v 108-**92**

Alcohol purification by hydrocarbons, Squire (full) *Sc Am Sup* * Sep 14-**89**; influence on human system, N. Davis Dec 17-**92**

Alcoholometer, Siemen's *Eng* * July 22-**92**

Alden George I., por. *Cassier's* * May -**92**

Algebra, lessons in *Pwr* files -**91**—**92**; determinant theorems applic., Tyler *Tech Q* Nov -**90**

Alkali process, ed. *Eng* Apr 13-**88**; trade, British, notes *E & Min* Sep 13, 20-**90**, (full) Apr 11, * 18-**91**; works, analytical methods for, Lunge Feb 14-**91**, *J. Soc Chem Ind.* See also under CHEMISTRY; NITRATES

Allan, Alexander *The Eng* June 12-**91**

Allen, Horatio, memorial notice, Forney *Am M E* v 11 -**90**; por. *E News* * Jan 11-**90**; (full) *R & Eng* Feb, Mar, Apr -**90**

Alloyage and igneous cementation, Elbers *E & Min* Nov 16-**89**

Alloys, strength, Unwin *Eng* Oct 4-**89**; Roberts-Austen Mar 16, 23, Apr 6-**88**, do. research committee report Nov 6, 6, * 13 -**91**; do. properties (full) *E & Min* * Apr 9, 16-**92**; strength at different temps., Unwin Jan 11-**90**, do. *The Eng* Oct 4-**89**; new and eng. applics., Garrison *F Inst* * June, July, * Aug, * Sep -**91**; Robert's report discuss., insets (full) *Inst M E* * Oct -**91**

Sc Am Sup Roberts-Austen (full) * Dec 8, 15, 22-**88**, strength at different temps., Unwin Nov 23-**89**, use in art metal work, Roberts * Aug 2-**90**, report (full) * May 28-**92**. See also STEEL alloys

ALUMINUM, and alloys, relative value, Pemberton *El Rev* Oct 6 -**88**; manuf. in electric furnace, Dagger *El Rev Lond* Sep 27 -**89**; copper and manganese, properties, Cowles, abs. *Inst C E* v 106-**91**, *E & Min* July 11-**91**. See also ALUMINUM alloys

BEARING metal, Dudley *F Inst* Feb, Mar -**92**, *Sc Am Sup* Apr 2-**92**

CHROMIUM and iron, Hadfield (full) *Eng* Sep 23, 30, 30, * Oct 7, 14-**92**; chrome pig iron and steel, Brustlein *R & Eng* Aug -**88**

ELECTROLYTIC decomposition and preparation, Roberts-Austen *El Wld* * Feb 4-**88**, Warren *Sc Am Sup* Mar 5-**92**

FERRO-chrome, Brustlein, *E & Min* Feb 1-**90**; iron and silicon, Hadfield *Eng* Oct 18, 25-**89**

MANGANESE, copper and aluminum, properties, Cowles, abs. *Inst C E* v 106-**91**, *E & Min* July 11-**91**

NICKEL and iron, magnetic properties, Hopkinson *El Rev Lond*

Alloys, NICKEL
Aug 8-**90,** do *El Wld* * Sep 6-**90**; nickel and steel, Riley (full) *Sc Am Sup* Aug 24-**89.** See also NICKEL alloys
STEEL, and chrome pig iron, Brustlein *R & Eng* Aug -**88**; and nickel, Riley (full) *Sc Am Sup* Aug 24-**89,** do. Mar 22-**90.** See also STEEL alloys
Allport, James *Eng* Apr 29-**92,** *The Eng* Apr 29-**92**
Alphand, Jean C. A. *Inst C. E.* v 107-**92**
Alpine engineering. Vernon-Harcourt, insets *Inst C E* * v 95-**89**
Aluminum *Am M E* an expt. with, Christie v 13-**92**; *Am Min* properties, A. E. Hunt (full) v 18, and other metals compared. Keep (full). v 18-**90**; *Cassier's* production, E. P. Allen * Feb, * Mar -**92**
El Eng problem future, from chemical standpoint, Wahl June 3-**91**; *El Rev Lond* do Aug 21, Sep 4-**91**; Guillaume May 8, properties, Hall, June 12-**91**; *El Rev* (name) 'Alium' for, O. Smith May 30; probable future, Wahl, (full) June 13-**91**; *El Wld* do (full) June 6, discuss. 13-**91**; properties, Hall May 30; 'Alium' (name), O. Smith 30-**91**
Eng Dagger Oct 18-**89**; Hunt, Langley and Hall, Mar 28, Apr 18-**90,** *E & Min* do. Mar 8, 15, 22-**90,** Ingalls, Jan 2-**92**
E News Feb 16-**89**; properties, Hunt, Feb 22, Mar 1; comparative cost Nov 1, production, Hall proc. * 8-**90**; Hunt (full) Feb 28, Mar 7, July 11-**91**
E Rec processes, Sep 5-**91**; *F Inst* Henderson, Oct -**88,** Roscoe, Sep -**89,** problem, Richards, Mar -**91**; *Inst C E* abs. v 110-**92,** *Dingler's* 284-**92**; *Locom* Apr -**92**
R Gaz Hunt, Apr 29-**92**; *Sc Am Sup* and sodium, Sep 15-**88,** Henderson (full) Jan 5-**89,** present status, Packard, Jan 9, action of liquids on, Lunge, Mar 5, Ingalls, May 28-**92,** *E & Min; Soc Arts Mass* Hunt (full) * -**91,** do. inset *Tech Q* * Apr -**91**; *The Eng* Aluminium Co. Aug 3-**88**; *Tech Q* in iron and steel, direct det., Drown, Oct -**91**
ALLOYS, Cowles, smelting, Heroult proc., Dewey *Am Min* v 18, * 18-**90**; manuf. in elec. furnace, Dagger *El Rev Lond* Sep 27-**89,** do *El Rev* Oct 19-**89,** do *El Wld* Nov 9-**89**; Heroult proc. *Eng* Oct 10-**90**; improvements in manuf., n *E & Min* May 24-**90,** *J Soc Chem Ind;* by Heroult proc. *E News* Sep 8-**88**; relative value *F Inst* Oct, correction, Pemberton, Nov -**88**; produced by elec. furnace, Langenhove, abs. *Inst C E* v

Aluminum, ALLOYS
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BRONZE and brass, as materials for propellers, Cowles *Am Min* v 18-**90**; do (full) *Sc Am Sup* Apr 12-**90**; bronzes, diagram *E News* * Feb 8-**90**
CARBURETTED iron, in, Keep *Eng* June 27-**90**
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COWLES proc. in England *El Wld* * Sep 29-**88**
DEVILLE-Castner proc. *Eng* Mar 22-**89**
DRAWING press, al. in, O. Smith *Am Min* v * 18, 18-**90**, do. *Eng* * Aug 29-**90**
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FERRIC cake (for sizing paper) *Sc Am Sup* Nov 9-**89**, *Chem Tr J*
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GRABAU's method, ed. *Eng* Dec 20-**89**, abs. *Inst C E* v 101-**90**, *An Mines*, *Genie Civil* v 16-**89**, v 17 May -**90**
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INSTRUMENTS of precision, Blake *Am Min* v 18-**90**
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Aluminum MANUFACTURE
7-**90**, value, Dagger Aug 15-**91**, Hunt (full) Apr 23, May 14 etc -**92**; *The Eng* * Nov 21-**90**
ORE, Nichols, n *Am Min* v 16-**88**
RAILROAD work, in, ed. *R Gaz* Nov 14-**90**, Hunt, Mar 27-**91**
SPECIFIC heat of, Richards *F Inst* Feb -**92**
STEEL, in steel castings, Keep *Am Min* * v 18-**90**, Hadfield (very full) v * 19-**91**, in steel ingots, Langley, iron and steel direct determination, Drown, McKenna v 20, 20-**92**; Keep *Eng* May 23-**90**; strength, etc. (full) *E News* Oct 11-**90**; Hadfield *Sc Am Sup* Apr 4-**91**
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WROUGHT iron and steel castings, in, Keep *E & Min* Aug 30-**90**, *Am Min*
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America, Fourth centennial Spanish exhib. *F Inst* Jan -**92**; improvements (boasting), Sweet *The Eng* May 6-**92**, *Am Machinist;* manufactures, recent growth *The Eng* Nov 25-**92**; American Powers conference, Henderson *Sc Am Sup* June 22-**89**. See also UNITED STATES
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Archbould, Ralph *Inst C E* v 101-**90**
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GOUR Noir viaduct, Vezere river, Uzerche, France, inset *E News* * Aug 18-**92**

Arches, MT. Vernon viaduct *E News* * Sep 1-**92**

SEGMENTAL and two-nosed catenaries, Alexander *Eng* * July 12 -**89**

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AMERICAN Fine Arts Soc. bld., N. Y., doorway, inset *E Rec* * Dec 31-**92**

APARTMENT house, Yosemite. N. Y., entrance *E Rec* * June 27-**91**

CATHEDRAL, Albi, France, inset *E Rec* * Apr 18-**91**; builders of the cathedrals, Snow *N E Mag* * Dec -**92**; Siena cath., Pisano *Sc Am Sup* * Oct 19-**89**

CHATEAU Epreville-Martainville, France, inset *E Rec* * Sep 26; (Lot) France, inset * July 25-**91**; Josselin, Brittany, inset * Jan 23-**92**

CHICAGO, Ill., Herald building, inset *E Rec* * Nov 14-**91**; sketches in *Sc Am Sup* * Dec 3-**92**

Architecture, CHURCH at Chateauneuf (Charente), France, inset *E Rec* * Sep 19; of St. Paul, Dax (Landes), France * June 6-**91**

CITY Hall, the, in Am., Ferree, insets *E Mag* * Nov -**92**; Bremen, Germany, inset *E Rec* * Dec 12-**91**; Cologne, Ger., entrance, inset * Apr 2; Hotel de Ville, Poitiers, France, inset * Dec 10-**92**

CLUB house, Century, N. Y., doorway, inset *E Rec* * Dec 19-**91**; Montauk, Brooklyn, inset * Apr 9; Catholic, N. Y., inset * Dec 17-**92**

COLUMBIAN exhib., U. S., Chicago, Van Brunt *Century* * May—* Aug -**92**

COUNTRY houses, Cambridge, etc., inset *E Rec* * Jan 17-**91**; Cohasset, Mass., interior, inset * Apr 23-**92**; English, inset * Aug 29-**91**; Arthur Little's, Boston, inset * Feb 20; Geo. Macculloch, Morristown, N. J., inset * Mar 26; Marblehead Neck, interior, inset * Jan 16-**92**; Swampscott, Mass., inset * Aug 15, Elihu Thomson's do, inset * May 9-**91**

COURT house, Beauvois, France, inset *E Rec* * Nov 19-**92**

FRANKFORT-on-Main, Ger., Union R. pass. station, insets *E Rec* * Sep 5-26 * Dec 5-**91**. See also BUILDING

GALLERY Victor Emanuel, Milan, inset *E Rec* * July 30-**92**

LIBRARY, Tilden Trust, N. Y., proposed, Bigelow *Scrib.* * Sep -**92**

MEAT market, old, Haarlem, Holland, inset *E Rec* * Feb 14-**91**

MOBBERLY Hall, Cheshire, England, inset *E Rec* * Nov 26-**92**

MUSEUM building and arrangement, Ferree *E Mag* * Nov -**91**; Amsterdam, Holland, inset *E Rec* * Feb 28; Hague, do., inset * May 23-**91**

MUSIC Hall, N. Y., main entrance, inset *E Rec* * Feb 13-**92**

PALACE of Justice, Hague, Hol., inset *E Rec* * Mar 7-**91**

RECEIVING vault, Woodlawn cem., N. Y., inset *E Rec* * Feb 27-**92**

RESTAURANT, Frankfort Palm garden, inset *E Rec* * Oct 31-**91**

ROMERBURG, Germany, inset *E Rec* * Dec 26-**91**

SWISS Vecchia inn, Maloja Pass, inset *E Rec* * Apr 16-**92**

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Arms and armor of ancient Japan, Baba *Soc Arts Mass.* -**88**

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Arsenal, Woolwich *The Eng* * Oct 2-**91**

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Artesian wells. See WELLS, artesian

Artificial limbs, Mark's *F Inst* * May -**89**

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ARCTURUS, recent conceptions, Knight, *Sc Am Sup* July 4-**91**

AURORA Borealis *Sc Am Sup* Mar 16-**89**

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INSTRUMENT works, Grubb's, Dublin *Eng* Dec 14-**88**

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MERCURY *Sc Am Sup* * Apr 26-**90**

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MILKY way, Gore *Littell's* Apr 30-**92**

NEPTUNE, discovery (great discoveries) *Locom* Dec -**89**

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Bates, Henry W., por. *Pop Sci* * Nov -**92**
Batterbee, Ranson C. *Inst C E* v 95 -**89**
Battle-ships. See NAVIES, names of countries
Bayly, George H. *Inst C E* v 93 -**88,** 98 -**89**
Bayonne, Port of *Eng* * Dec 6-**89**
Bazalgette, Joseph W. *Eng* Mar 20-**91,** (full) *Inst C E* v 105 -**91,** *The Eng* Mar 20-**91**
Beach protection. See NEW Jersey coast movements
Beams and girders, the continuous girder as a tipper, Lindenberger *Am C E* * v 26 -**92**; theoret. strength, cor. *Eng* July 1-**92.**
E News cross-sections, unsymmetrical, Johnson * Feb 4-**88,** loading long girders on cars, movable frame * Jan 9-**92**
F Inst jointed bow, theory, Werner * May-* July, Sep, Oct; continuous, indeterminate multipliers, Lindenberger, Dec -**88**
Inst C E jointed bow, Werner abs. v 95 -**89**; cast iron and steel, expts. on strain in outer layers, Segundo (full), inset * v 98 -**89**; braced, stresses and deflections, Stewart * v 109-**92**

Beams and girders

R & Eng contin. framed, stress in, Hiroi May -**88**; lattices, stresses on, method of obtaining, Robertson *Sc Am Sup* * Mar 24-**88**; expts., Sondericker, inset *Tech Q* * Oct -**88**

The Eng struts, stiffness of, expts., Mason Coll. Jan 6; lattice girders, graphic evaluation of stresses in flanges, Robertson Mar 16, do. Stokes, cor. Apr 27, do. Parsey, cor. May 18, stresses in statically undetermined systems, Ende, cor. 18; transverse strength of beams, D. Clark, June 1, 22, 29-**88**. See also BRIDGES; BUILDINGS; GIRDERS; ROOFS, etc.

Bearings, materials without lubricants, Hedges anti-friction *El Rev Lond* Aug 12-**92**, graphite self-lubricating *E News* * Feb 8-**90**, May 19-**92**, do. *The Eng* Aug 19-**92**; metals, phosphor-bronze *Eng* July 29-**92**, *R & Eng*

Beauchamp, Clayton S. *Inst C E* v 100 -**90**

Becker, Max J., por. *E News* * Feb 9-**89**

Beckley, John N., por. *St R J* * Sep -**92**

Becquerel, Edmund, por. *Sc Am Sup* * July 4-**91**

Beer, treatment and storage, Hartley *Sc Am Sup* May 2-**91**, preservation by pasteurization * Nov 19-**92**

Bell, Alexander G., por. *El Eng* * Sep 10-**90**, *El Rev* Sep 10-**92**

Bell, William *Inst C E* v 109 -**92**

Bell, Wilson, *Inst C E* v 101 -**90**

Beltrami, Guiseppe C. and the Miss. river *Locom* Mar -**90**

Belts and belting, tractive force of leather on pulley faces, S. Smith *Am M E* v 10 -**89**; Schieren *El Rev* * Mar 5-**92**; horse power corresponding to various speeds, table *El Wld* Feb 14-**91**; transmission of power by, Gale *J Assoc Eng Socs* Nov -**88**; angle of contact, table *Pwr* Apr -**92**; Jewell Belting Co. *St R J* * Apr -**92**

CARRIERS and machinery, Fischer, abs. *Inst C E* * v 110 -**92**, *Zeit deut Ing* v 35 -**91**

FASTENINGS *Pwr* * Aug -**89**; Sargent's fastener *The Eng* Oct 12-**88**

LEATHER, width of single, for various horse powers, Grimshaw, table *El Eng* Apr 22-**91**; Schieren * Mar -**88**, do. *El Rev* * Mar 3-**88**; and canvas-rubber, comparative tests, S. Webber *El Rev Lond* Sep 5-**90**, do. *El Wld* Aug 23-**90**

LINK, Page Co. *El Rev* * Apr 12-**90**

TESTING machine, Alden *Am M E* * v 12 -**91**

Bennett, William C. *Inst C E* v 99 -**90**

Berlin, street cleaning n *E News* May 31-**90,** do. and paving in '89, Dec 13-**90.,** See also GAS supply; PAVEMENTS; SEWERAGE; WATER-works, etc.
Berliner, Emile, por. *El Eng* * Nov 19-**90**
Bernays, Edwin A. *Inst C E* v 91-**88**
Berwind, Charles P., por. *E & Min* * Dec 13-**90**
Bessemer, Ala. *Eng* * Aug 22-**90**
Bessemer, Henry, autograph letter on iron and steel metallurgy and success of his invention, Kitson addr. *Am Min* * v 19 -**91**; por. *Sc Am Sup* * Aug 29-**91**
Best, Stephen C. *Inst C E* v 109 -**92**
Beton manufacturing and lifting ap., Port of Bilbao *Sc Am Sup* * Nov 19-**92.** See also CEMENTS and mortars
Bevel gear cutting machine, Paris exhib. *Eng* * Nov 8-**89**
Beverages, Simmonds *Sc Am Sup* June 30-**88**
Bibliography, Pantobiblion, Internat. Rev. of World's Scientific Literature, Kersha, ed., St Petersb., notice *R & Eng* Aug -**91.** See also INDEX
Bibra, Charles F von *Inst C E* v 100 -**90**
Bicycles, exhib. *Sc Am Sup* * Mar 30-**89,** Stanley exhib. * Mar 29-**90,** what keeps them upright, McDiarmon, cor. * Oct 29-**92**; Stanley exhib. *The Eng* Feb 10, 17, 24-**88,** * Feb 22-**89,** * Feb 7, 14-**90,** * Feb 13, 20, * Dec 25-**91**
Bidder, G. P. (mental cal.), Pole *Inst C E* v 103 -**91**
Bigg-Wither, Thomas P. *Inst C E* v 103 -**91**
Bilbao ship-building yard *Eng* * Oct 25-**89**
Biology, protoplasm and cells, recent science, Kropotkin *Nineteenth Cent* May -**92**
Bird, James B. *Inst C E* v 109 -**92**
Biscuit machinery, Baker's *The Eng* * June 14-**89**
Bismuth *Locom* Sep -**92**
Bitumen and compounds, Blake *Am M E* v 18-**90,** *Wash* Feb -**90**
Black, Frank C. *Inst C E* v 98 -**89**
Black Hills of Dakota, ore deposits, Carpenter (full) *Am M E* * v 17 -**89**
Blake, Francis C. por. n *E & Min* * Mar 14-**91**
Blast furnaces, iron, *Am Min* expts. illus. descent of the charge, Richards * v 16 -**88**; lines, Walsh; effect of vel. and tension of gases on reduction of ores, T. Robinson; large, on Ala. material, Gordon * v 17 -**89**; Durham, filling and blowing in,

Blast furnaces
Fackenthal, insets; peculiar working, Wittman * v 18 -**90**; Am. development with reference to large yields, Gayley (full) * v 19 -**91**, do. discuss. (full); first in Am., Adams * v 20 -**92**
Cassier's notes, Hartman, Sep-**92**, do. *F Inst* inset * Aug-**92**
Eng Am. practice, Hudson * Feb 1, Cochrane, Nov 1-**89**
E & Min how pig iron forms in, Elbers, Aug 24, Nov 2-**89**; development and large yields, Gayley * Oct 4-**90**
E News selection of ores, limestones and fuel for, Gordon, Feb 20-**92**
Inst M E practice with lime as flux, Cochrane, discuss. Oct -**89**
Sc Am Sup Am. development, Gayley (full) * Nov 15-**90**; practice, Hudson, Feb 16-**89**, *Ironmonger;* development of Am. industries since Columbus, Durfee *Pop Sci* * Dec -**90**, Jan etc. -**91**; descent of charge, expts., Richards *Tech Q* * Dec -**87**
BIRMINGHAM district practice, notes on iron-ores and fuels, Brainerd *Am Min* v 17-**89**
BLAST, cal. of, Ledebur *E & Min* Feb 21-**91**
CHARGES, expts. on descent of, Richards *Eng* * Jan 20-**88**; cal. of, Ledebur (full) *E & Min* Dec 13-**90**
CHARGING-bells, new device for operating, Roberts *Am Min* * v 16 -**88**, do. *E & Min* * Apr 21-**88**; devices, Howe * Aug 23-**90**
CHEMICAL reactions in, Elbers *E & Min* Feb 22-**90**, investigation, Ledebur, May 23, 30-**91**
CUPOLA furnace, Stewart 'Rapid' *Eng* * Dec 5-**90**; construction for melting pig iron, Gouvy, Durfee *E & Min* * Feb 16, 23 * Mar 9, 16, 30-**89**
EDGAR Thomson, genesis of, Shinn *Am Min* * v 19-**91**
FUELS, feasibility of using cheaper, Wainwright *Am Min* * v 17 -**89**
GASES, expts. on, Whiting *Am Min* * v 20 -**92**
GREAT Britain *The Eng* Oct 12-**88**
HEARTH and bosh walls preservation, Gayley *E & Min* * Feb 20-**92**
HEAT-balance, Ledebur, Nitze *E & Min* Jan 30-**92**; heat cals. and dimensions of chimneys, etc. for firing boilers, Roberts *Am Min* v 17 -**89**; development and appropriation of heat, Wright *Eng* Jan 3-**90**. See also BLAST fur. temperature

Blast furnaces, HOT blast stoves, regen., operating, Wainwright *Am Min* * v 17-**89**; Massick's & Crooke's, Am. pat. fire-brick * v 19-**91**
LEAD furnace, stone coal in, Neill *Am Min* v 20 -**92**
LININGS imp., steel and melting, Elbers *Sc Am Sup* Dec 17-**92**
LOW Moor, Va., flue dust of, Means *Am Min* v 17-**89**
MAGNESITE, use as refractory material, Sorge, abs. *Inst C E* v 92 -**88**, *Stahl & Eisen* v 7 -**87**
MONONGAHELA Fur. Co., McKeesport, Pa. *Eng* * July 29-**92**
ROCK-drill for opening tapping-hole, Baker *E News* * Nov 3-**92**
SHEFFIELD, Ala. inset *Eng* * Oct 24-**90**, *Sc Am Sup* * Dec 6-**90**
SLAGS, sulphurous and desulphurous, Elbers *E & Min* June 8, 22-**89**; utilization and disposal, Hawdon *Eng* Feb 19-**92**, do. insets *Inst M E* * Feb -**92**, do. *Sc Am Sup* Apr 2-**92**, *Iron*
SILICA determinations in cinder, C. Jones *Am Min* v 16 -**88**
STOCK hoist, aut. inclined, Pioneer Min. Co. *E News* * Feb 28-**91**
TEMPERATURE determination, Ledebur *E & Min* Aug 22-**91**. See also BLAST fur. heat
TUYERE slagging-valve, Cook *Am Min* * v 17 -**89**
UNION Steel Co., record *E & Min* Feb 18-**88**
WARWICK anthracite and coke, separate and mixed in, Cook *Am Min* v 17 -**89**
Blasting, big quarry blast, So. Beth. N. Y. *E News* * Sep 21-**89**; large masses of iron and steel, abs. *Inst C E* v 100 -**90**, * *Woch ost* -**90**. See also EXPLOSIVES; MINING; QUARRYING; TUNNELING
Blatchley, Charles G. *Inst C E* v 91 -**88**
Bleaching ap., Cloudman *Sc Am Sup* * Oct 3-**91**; of cotton, Apr 2-**92**
Blindness and the blind, Fox *F Inst* June, * July -**89**
Block, Weston's Triplex spur-gear *E & Min* * May 31-**90**, *R Gaz* * May 30-**90**
Blood, gases of the, McKendrick (full) *Sc Am Sup* Jan 5-26-**89**; blood-cells, white, function of, Jordan *Tech Q* May -**90**
Blow, Albert A., por. *E & Min* * Aug -**91**
Blow, a knock out *Sc Am Sup* * Nov 15-**90**
Blowers and fans, expts., Snell *Am M E* v 9 -**88**; fan pressures, ed. *The Eng* Oct 5-**88**, fan effic., Cherry, cor. * Jan 11, Lodge 18 * 25, fan phenomena, ed. * Feb 1, 1, Unwin, cor. 8,

Blowers and fans
Lodge cor. 15, Bower, cor. * Mar 8, etc. -**89.** See also ATMOSPHERIC resistance
ATKINSON'S rotary blower *The Eng* * Oct 21-**92**
BLACKMAN air propeller *Eng* Feb 24-**88**
CAPELL fan, expts., Bochet *The Eng* Oct 26, Nov 23, Dec 7-**88,** * Jan 11-**89**
CENTRIFUGAL ventilators, Norris, table *Eng* Mar 4, * 18, * Apr 22-**92**; blower expts., Isherwood *F Inst* Apr -**89**
ROOT'S blower *Eng* * June 29-**88,** *The Eng* Aug 17-**88**
Blowing engines, blast furnace, Gordon *Am M E* * v 12-**91,** *Cassier's* * Feb -**92,** *E News* * July 1-**91**
Blow-pipe tests (various subs.), Moses *Sc Am Sup* June 20-**91,** *Sch of Mines Q*
Blue print processes, etc., and large photos., Thurston *Am M E* * v 9-**88**; blue proc. formula *E News* June 16, ap., Ingoldsby * Aug 11, pneu. frame * Dec 15-**88**; frame *E Rec* * Dec 3-**92**; large, Cleave's method, Thurston, abs. *Inst C E* v 91-**88,** *Am Machinist* June 25-**87**; ap., Rockwood *R & Eng* * Oct -**91**; reversed, Pellet's proc. *R Gaz* Feb 21-**90**; Bradford *Sc Am* Sep 8-**88**; cyanotype positive proc., Waterhouse (full) *Sc Am Sup* Jan 5-**89**; violet, red and green prints, Estabrooke, Photog. in Studio and Field, bk. review, abs. Mar 15-**90**
Bluestone quarrying, U. S., Day, cen. bull. *E & Min* June 6-**91**
Boats, diving *Eng* Aug 9, 23-**89**; driving by water-jets, etc. *Sc Am* Feb 9-**89,** *Mechanics.* See also FERRY-BOATS; LAUNCHES; LIFE-BOATS; STEAM-BOATS; TORPEDO BOATS; TUG-BOATS: YACHTS, etc.
Bodley, Rachel L. *F Inst* July -**88**
Bohemia, Pribram, mines and mills, Meier *E & Min* July 2, 9 16-**92**
Boilers, Steam, Manual of, Thurston, Wiley, N. Y. -**88,** bk. review *R Gaz* Apr 13-**88**; some preventable wastes of, Kent *Cassier's* Jan -**92**; Steinmüller, Frankfort elec. exhib. *Eng* * June 5, Kuhn do. * 12-**91**; designing *Locom* July, J. Allen (full) Aug * Sep * Oct -**88**; cals., etc. *Pwr* Jan-Mar -**89,** largest in world, Lorillard Tob. wks., Jersey C., White * Apr, Apr -**90**; types, various, relative merits, Golding *Sc Am Sup* Oct 27-**88,** governing proportions of, Emery (full) * Mar 2, 9, safe for amateur work (various types), Hiscox * June 15-**89**; heat transmission in, Hudson *The Eng* Dec 5, 12 * 26-**90.**

Boilers, steam

See also LOCOMOTIVE-MARINE-PORTABLE-ROTARY boilers, etc.

APPLIANCES, boiler and engine room *Pwr* * Jan.- * July- * Sep - * Dec -**90,** * Jan- Apr * June- * Dec -**91.** See also BOILERS, gauges—safety valves, etc.

BABCOCK & Wilcox. See under BOILERS, tests; BOILERS, water tube

BELPAIRE fire-box, 90-in., for Cal. & Hecla Mining Co. *R Gaz* * Mar 21-**90**

BIETRIX's, Batault, abs. *Inst C E* v 92 -**88,** *Compt R* Sep -**87**

BLOW-off cock *Eng* * Jan 17-**90**

BRACING, steam domes *Locom* * June * July -**90**; heads, May -**88,** Aug -**89,** *Pwr* * May -**90,** * Sep -**91.** See also BOILERS, strength

CIRCULATION of water in, effect of on quality of steam, Barrus *Am M E* v 9 -**88**; Babcock *E Rec* * May 16-**91,** *Sc Am Sup* * Apr 12-**90**

COMBUSTION with natural and forced draft, Spence *Eng* Feb 10 * 24 * Mar 2-**88**

COMPLETE combustion, Loughran, cor. *Pwr* Sep -**92**

CONNECTION of steam mains to *Locom* * May, arr. of steam pipes * Aug -**92**

CORLISS vertical, Wamsutta mills, New Bedford *Pwr* * Jan -**91**

COVERINGS, non-conducting, Collins *E Rec* Oct 31-**91.** See also STEAM-pipe coverings

DAMPER regulator, Mason's *E & Min* * Jan 18-**90**

DANGER signals, Grimshaw *E Mag* May -**91**

DURDON compound *R & Eng* * Mar -**92**

DEPOSITS in, use of crude petroleum, Lyne *Am M E* v 10 -**89**; Lewes *Eng* Mar 27, May 1-**91**; do. *Sc Am Sup* May 30 -**91,** do. *The Eng* Apr 3-**91**; pumping solvents into *Locom* July -**88**; scale, composition, Stillman *R Gaz* Apr 4-**90**; feed waters and incrustation, Silvester *Sc Am Sup* Oct 22-**92.** See also BOILERS, kerosene in

DETERIORATION of, J. Allen *Sc Am Sup* * June 9-**88**

DOWNWARD draft furnace, test, Galloupe *F Inst* Feb, Lozano, cor. May -**88.** See also BOILERS, tests, downward draft

EXPLOSIONS, Thurston, bk., Trübner, Lond., Wiley, N. Y.; Daniels *Am M E* * v 13 -**92,** *E News* * Dec 15 *Iron Age* * Dec 8-**92**; J. Allen *Cassier's* * Jan, peculiar, Daniels * Dec -**92**

Boilers, EXPLOSIONS

Eng the Dudley, Jan 20, at Friedrichshütte * Mar 30, in '87, Marten * May 11, 18-**88,** do. * July 12-**89,** do. * July 18, at Crosby and Halifax, Apr 25-**90**; in '90, Marten * Oct 23-**91.** See also BOILERS, tests, red-hot furnace crown expts.

E News English, in 1887 and for 15 years, table, June 9, 9 -**88**; record of, Hartford Ins. Co. reports *Locom* files **88—92**; Friedrichschütte great, June -**88**; causes and remedy, Wright, May -**89**; since 1879, table, June; causes, Thwaite * Sep -**91**; '91, summary, Feb -**92**; a cause of, Fowler *R & Eng* May -**90**; Warren Springer, Chic., Nagle *R Gaz* * Feb 19-**92**; *The Eng* Jan 15-**92**

FEED-water heaters, Cotterill *Eng* May 2, Maclaine's internal * June 13, Monson's * July 4-**90**; per cent. of saving by, table *Pwr* Apr -**90**; Thomson's *The Eng* Jan 27-**88**; and condens. ap., Naval exhib., Lond. * July 31-**91**

FIRE-box and grate, Cohen's *R & Eng* * Oct -**92**

FIRING, Hammond *El Wld* Mar 5-**92**; econom., expts., Bird *Eng* Dec 6-**89**; with soft coal *Locom* * Oct -**89**

FITTINGS, combination *Eng* * June 22-**88.** See also BOILERS, appliances — gauges, etc.

FLOAT, Wright's *E News* * Aug 9 -**90**

FLUES, strength of, D. Clark, cor. *Eng* Sep 21-**88,** *Locom* * Oct -**92.** See also BOILERS, tubes

FORCED draft, construction for *Eng* * Mar 20-**91.** See also BOILERS, furnaces, steam jets; MARINE boilers, do. Yarrow

FRONTS *Locom* * Sep * Dec -**90**

FURNACES and flues, cylindrical, safe working pressures for, Longridge *The Eng* Sep 21-**88,** a new system of generating steam, R. Scott *E News* July 28-**88**; corrug., Milburn pumping station, Brooklyn water-works * Mar 12-**92**; Donnelly fire-grate *R Gaz* * Jan 6-**88**; external *Locom* * Mar -**91**; downward draft, test, Galloupe *F Inst* Feb, Lozano, cor. May -**88**; flue gases *Eng* * Oct 3, 10-**90**; Godillot's, Paris exhib. * Sep 20-**89**; for liquid fuel, Busley *Pwr* * June * July -**88**; the Murphy * Apr -**89**; the Perret, for small coal *The Eng* * Feb 8-**89**; Roney stoker, See BOILERS, stokers

SMOKE preventing *E & Min* Aug 6-**92**; Vulcan aut. *Pwr* * Nov -**90**; Ackroyd-Willoughby's, trial *The Eng* * May 15-**91**; Sennett, n * Aug 26-**92.** See also SMOKE prevention

STEAM jets for forced draft in, expts. *E News* Apr 4 * Sep 19-**91**; temp. of fire surfaces *R Gaz* Nov 22, Dec 13-**89**

Boilers, FUSIBLE plugs, Bailey's *R Gaz* * July 13-**88**; *The Eng* Sep 28-**88**
GAUGES, water, Hopkinson safety *E News* * Jan 2-**92**, *Eng*; *R Gaz* * Oct 5-**88**; fittings, Gray *The Eng* Jan 22-**92**
HAZLETON (Porcupine) vertical *Pwr* * June -**88**, *St R J* * Aug -**89**
HIGH pressure, prog. in generating, Babcock *Cassier's* * June -**92**; Thwaite, cor. *El Rev Lond* Dec 9-**92**; with forced draft, Turner *The Eng* July 20-**88**
HIGH water indicator, Schwarzkopff's *E News* * Nov 1-**90**
HORSE power (full) *Locom* Jan -**92**, com. rep. *Pwr* Sep -**90**
HOUSE, economy, Little, cor. *The Eng* Oct 9-**91**
HUDSON river, State Asylum, Poughkeepsie, N.Y. *Pwr* * July-**89**
INSPECTION, and registration bill, English, '91 *Eng* Mar 13-**91**; Am. reports, Hartford Steam Boiler Insp. & Ins. Co. *Locom* files **88—92**; insurance and Bd. of Trade *The Eng* Sep 28-**88**
KEROSENE oil, use in, for preventing formation of scale, Lyne *Am M E* * v 9 -**88**, Carpenter, n v 11 -**90**, *E News* May 24 -**90**, *E Rec* Dec 31-**87**, *Sc Am Sup* Feb 11-**88**
LANCASHIRE, evap. of, Longridge *Eng* Apr 11, 18-**90**, do. *The Eng* * Feb 14-**90**, Nov 6-**91**; three-flued, trial, Crossland, Mar 11-**92**; mod., Boswell *Eng* Oct 30, construction do. * Nov 20-**91**, do. discuss., insets *Inst M E* * Oct -**91**. See also BOILERS, tests, Lancashire
LENTZ'S stayless *Eng* * Dec 19-**90**
MAKING machinery *The Eng* * Dec 26-**90**
MANCHESTER Steam Users Assoc. report *E News* July 19-**90**
MAN-hole and steam nozzle locations *Locom* June -**89**
MECHANICAL stokers. See BOILERS, stokers
OIL burner *R & Eng* * Apr -**88**. See also MARINE boilers, liquid fuel
PLANTS, see STEAM plants
PLATES, welding and flanging *Cassier's* Nov -**91**
RIVETED joints, longitudinal, Cooper *Am M E* v 10 -**89**, do. *F Inst* Aug -**89**; Le Van * Apr * May -**91**; expts., Kennedy, report, insets *Inst M E* * Oct -**88**; Cooper *Locom* Apr -**88**, July -**89**, and seams, strength, Cooper * Sep, strains * Oct * Nov -**90**; Allen (full) * July * Nov -**91**; double seams, Ruggles *Pwr* June -**90**; Le Van (full) * Aug, J. Allen * Nov -**91**; Le Van *Sc Am Sup* * July 4, 11-**91**. See also BOILERS, strength

Boilers, ROTARY, connections for, *Locom* Jan -**88**
SAFETY valves, cals. *Locom* May -**88**; and levers *Pwr* * Oct -**91**; springs, diag. for cal. *The Eng* * June 26-**91.** See also SAFETY valves
SCALE, composition, Galveston ,Tex., Kœnig *F Inst* Aug -**91**
SCHALEHN'S fire-bridge *The Eng* Jan 13-**88**
SELLERS. See BOILERS, water-tube, Seller's
SEMI-locomotive *El Rev Lond* * May 27-**92.** See also PORTABLE boilers and engines
SERPOLLET'S instantaneous generator, *El Wld* * Nov 23-**89**; Kennedy, expts. *Eng* Sep 18-**91.** See also STEAM carriage, Serpollet's
SETTINGS, (external furs.) Willimantic I & Steel Co. *E News* * Oct 13-**92**; over a single furnace *Locom* Apr -**89**; numbers of bricks in, Nov -**91**; *Pwr* Aug -**90**
STEAM drums, attachment of nozzles to *Locom* Feb -**88**; dome bracing * June * July; nozzles attach. * Aug -**90**
STEAM pipes connections *Locom* * Aug -**90**
STRENGTH of shells, expts., J. Scott *Eng* * Apr 26-**89**; stay, Yarrow's tubular * Nov 7-**90**; short, strength of * Apr 17, cor. * May 15-**91**; stay-bolts prob., ed. *E News* Mar 21-**91**; new steel boiler, expt. test, Scott *Locom* June -**89**; heads, unbraced wrt. iron * Feb; hydr. tests, Nov -**90**; bursting pressure * Feb, stayed surfaces (full) * Mar -**92**; bracing and stay-bolts *Pwr* * Sep -**91**; bursting pressure of cylindrical *Sc Am Sup* * Mar 26-**92.** See also BOILERS, bracing—riveted joints
STOKERS, aut. conveyor *Eng* * June 14, 28-**89**; plant with, Curtis Davis, Cambridge, Mass. *E News* * Dec 1-**92**; machine stoking, discuss., insets *Inst C E* * v 104 -**91**; Roney stoker *Pwr* * Aug -**89**; mechan., Whitham (full) * July -**91**, Roney *St R J* * Aug -**89**; mechan., Roney (full) July -**91.** See also MECHANICAL stokers
TESTS and trials, expts., Donkin *Eng* July 4 * 18 * Aug 1 * Nov 21-**90** * Feb 27, May 15 * Oct 2-**91** * Mar 18 * July 22 * Oct 21-**92**; and fuel econ., Holliday, inset *Inst C E* * v 92-**88**; overheating expts., Hirsch, abs. v 108 -**92**, *Bull Soc E Socs* -**90**; Otis Co's mills, Ware, Mass. *Locom* * Mar, equiv evap. Apr -**90**; clean and foul boilers, comparative, July -**92**; duty, factors of evap., table *Pwr* Feb, Mar, May, Sep -**89**, how conducted * July -**92**; Barrus, bk. review *R & Eng* Apr -**92**; with natural and forced draft, Spence *The Eng* Feb 17-**88**

Boilers, tests, BABCOCK and Heine, comparative, Emery, report *St R J* Apr -**92**
BABCOCK & Wilcox, Longridge, report *Eng* * July 11 * Dec 19-**90**
BLAST furnace waste gas as fuel, effic., Jacobus *Am M E* v 17 -**89**
COIL boilers, Gov't. *E News* Oct 13-**88**; Ward's coil, U. S. Navy * Aug 29-**91**
DONNELLY'S pat. grate, Schneider, abs. *Inst C E* v 92 -**88**, *Zeit Dampf* -**87**
DOWNWARD draft, Complete Combustion Co.'s tubular, Galloupe *E News* Mar 23 * Sep 7-**89**, Galloupe *F Inst* Feb, Lozano, cor. May -**88**
LANCASHIRE, evap. of, Longridge *Eng* Apr 11, 18-**90**, do. *The Eng* * Feb 14-**90**, Nov 6-**91**; three-flued, Crosland, Mar 11-**92**
OVAL, two-flues, evap., abs. *Inst C E* v 91 -**88**, *Zeit Verb Dampf* -**87**
PORTABLE, W. Webber *Am M E* * v 13 -**92**
RED-hot furnace crown expts., McKean *Cassier's* Jan -**92**; do. explosions *Eng* Jan 30 * Feb 13 * Mar 6, 13 – Apr 17-**91**, do. *Pwr* * Nov -**90**
STEEL, open-hearth, use and testing for, Goodall, discuss. (full) *Inst C E* * v 92 -**88**
WARD'S sectional *Eng* * Apr 5-**89**
WATER-tube, Knap *The Eng* May 25-**88**
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Bolden, Henry *Inst C E* v 109 -**92**
Bolivia, mineral resources, Minchin *Eng* * July 11-**90**, Apr 17-**91**
Bolton, Francis J. *Inst C E* v 93 -**88**
Bolts, drift, holding power, expts. *E News* Feb 28-**91**, *E Rec* Nov 29-**90**

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Boring machine, for angular holes *E News* * Mar 21-**91**; hand power diamond (for ore deposits), Nordenström, abs. *Inst C E* v 99 -**90,** *Jern Kontorets An* -**88,** *Oest Zeit Berg* v 37. See also DRILLS; MINING; QUARRYING
Boston Heating Co's plant, Abbott, insets *Am Min* * v 16 -**88,** *Eng* * Aug 30, * Sep 6-**89**
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Bottle manufacturing by machinery, glass, Ashley *Eng* * Oct 11-**89**; do. German, Partello *Sc Am Sup* June 30-**88**
Boulanger, General, por. *Sc Am Sup* * July 7-**88**
Bourdeaux, John *Inst C E* v 104 -**91**
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Bramwell, George W. W. *Inst C E* v 109 -**92**

Branner, John C., por. *E & Min* * Dec 12-**91**

Brass foundry building, Nat. Meter Co., Brooklyn *E Rec* * June 18 * Sep 10-**92**; (locom. construction) *The Eng* Oct 21 * Nov 4 * Dec 30-**92**

Brazil, Ivins *Sc Am Sup* Jan 4-**90**

Brewery, Guinness' *Eng* * Sep 14, 28, tramways, Georghegan * Oct 12-**88,** do. St. James Gate *The Eng* Aug 24, tramways in, 31, 31-**88,** do. Dublin *Sc Am Sup* Dec 1-**88**

Brewing, Paris exhib. *Sc Am Sup* * May 10-**90,** *Genie Civil;* Trades exhib. *The Eng* Nov 2-**88**

Bribner, Alan *Inst C E* v 101 -**90**

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Bridges, *Eng* spec., Am., Pencoyd Iron Works, Dec 7, 21 -**88**

E News the world's great, and North river, proposed * Jan 14; wts. of, formulas, Mosscrop, Mar 17-**88**; live loads and wts. of, Pegram, ed. * Jan 10, 10; and trusses, skew pin connections, imp. in, Steiner * Oct 17 * Dec 26-**91**; soft steel in, Lewis, Nov 7-**91,** Jan 16, Mar 26-**92**

E Rec soft steel in, Lewis, Mar 12-26, Apr 2-**92,** do. Bischoff, Krohn, abs. *Inst C E* v 107 -**92,** *Zeit ost Ing* -**91**

R Gaz development of iron, Whipple * Apr 19; eye-bars, wrt. iron and steel, tests, Gaylor * May 10-**89,** *J Assoc Eng Socs;* long plate girder (115-ft.), econ., G. Thomson * May 23 -**90**; details, Swensson, Feb 26; disputed points in designing, Waddell, cor. Sep 9, 23-**92**

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ACCIDENTS, failures, Am., G. Thomson *Eng* * Sep 14-**88**; Apple river, fall *E News* Mar 31; Arcole Apr 14-**88**; wreck of Browning's trestle, Vir. Midland, Thornton, cor. *R Gaz* * July 20; railroad bridge failures, G. Thomson, and ed. *R Gaz* Sep 28, Oct 12-**88**; the Mœnchenstein, Basel, Switz. (full) *E News* * Aug 1, ed. 8, Dec 26-**91**, do. *R Gaz* * July 17-**91**, do. *The Eng* * Dec 4, 11-**91**, Ende * Feb 19-**92**. See also RAILROADS, accidents

ALBANY, N. Y., Hawk st. viaduct *E News* * Feb 16-**89**

ALOGOAS Ry., Brazil *E News* * July 25-**91**

AMERICAN, and English, Fidler *Eng* Nov 9, Dec 7, 21, 28-**88**, new, ed. Oct 3-**90**; table, Berkley *Inst C E* v 107 -**92**; French engineer on, Le Rond *R & Eng* Sep -**89**, *An Ponts*

AQUEDUCT truss *E Rec* * Mar 14-**91**

ARAUCO R and Bio-Bio, Manby *Inst C E* * v 108 -**92**

ARCHED, *Eng* pressures on voussoirs and abutments, Paterson, cor. * Dec 14, joints, pressures, Trautwine * 21-**88**

E News stone, Springfield, Mass., proposed * May 12, June 2, Herschel, July 28 ed. Aug 4 * Nov 3; skew or spiral, Paret, Cin. & Rich. R. * Oct 20, 27, Nov 3-**88**, Johnstown ribbed arch, Pa. * July 20-**89**; Conemaugh, Penn. Cen. R. * Mar 29; stone. Elyria, O. * June 21; ribbed steel, Rock Lane, New Haven, Ct., Hill * Aug 16-**90**; stone, Falls of Schuylkill, Phil. & Reading R. * Jan. 24; stone, Elkader, Ia., Turkey river * Apr 11; Monier method of constructing, Berlin * May 23; stone, with lead joints at key * Oct 24-**91**; New Brunswick, N. J., Albany st. masonry arch * Apr 16; Gour Noir viaduct, Vegere river, Uzerche, France, inset (full) * Aug 18; Mt. Vernon viaduct * Sep 1-**92**

E Rec St. Paul, Col. st. skew arch * Nov 23-**89**; Minneap. steel * May 10-**90**; stone park, Prov. * July 23-**92**; skew arch course traces, Haines *Inst C E* v 105 -**91**; German construction with hinged arches, Riviere, abs. v 107 -**92**; *An Ponts* June **91**; Monocacy Creek stone, sidewalk, Beth., Pa., Grossart *Lehigh Eng J* Apr -**89**; Wheeling, W. Va., 158-ft. *R Gaz* * Aug 15-**90**. See also ARCHES

ARTHUR Kill draw-bridge, Staten Is. Rap. Tran. Co. *R Gaz* * June 22-**88**, * July 26-**89**

ASSAM suspen., Doyong river *The Eng* * Aug 15-**90**

AUSTRIA iron, renewal, Huss, abs. *Inst C E* v 98 -**89**, * *Zeit ost Ing* -**89**

Bridges, BALTIMORE, Md., Cedar Ave. *R Gay* * Sep 18-**91**
BATTERSEA, England, inset *The Eng* * July 25-**90**
BEARINGS, fixed and expan., Sinot-Pichin R. *The Eng* Oct 12-**88**
BEAVER river plate girder, Pitts. & L. Erie R., inset *E News* * Apr 2-**92**
BELAJA river, Samara-Ufa R., Russia, inset *Eng* * July 11, 25 -**90**
BERLIN, the Moltke, Pinkenburg, iron tilt do., abs. *Inst C E* v 92 -**88,** *Deut Bauz* -**87**
BERLIN Iron Co. plant, E. Berlin Ct. *E News* * Oct 3-**91**
BIG Warrior river, Memphis & Birm. R., Cordova, Ala. *R Gaz* * June 29-**88**
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BISMARCK, erection *E Rec* * Nov 3-**88**
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BOAT, Indian, Fenner *R & Eng* * Sep -**88**
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BROAD & James river, erection *E Rec* * Feb 7-**91**
BROCHOCKIS portable *Eng* * Apr 5-**89**
BROOKLINE, Mass., plate girder highway, inset *E News* * Sep 19 -**91**
BROOKLYN and N. Y., (East River) suspension *Eng* traffic * July 27-**88,** Oct 24-**90**
E & Min problem, Apr 28-**88,** (terminals) inc. of carrying capac., Wellington * Apr 5-**90,** problem * Jan 17-**91**
E News growth of traffic * Feb 11, enlarging capac., report of bd. of experts and eds., with inset map of residence areas * Mar 17, 24, terminals, report Apr 21, adopted plans for, C. Martin, Wellington and eds. * 28, do. discuss. *Brooklyn Eagle* 28-**88,** terminal plans *E News* * Jan 11, Mason, cor. * Mar 8, problem May 3-**90,** new terminals, report * Jan 17, enlarging capac., ed., diags. and second report * Feb 14, 14, 28, cor. * Mar 7, cor. * 21-**91**
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Bridges, BROOKLYN

St R J bd. of experts report * Feb -**91,** report, Jan -**92.** See also CABLE railroads, Brooklyn bridge

BUFFALO Trace, viaduct Ky. Midland R. *E News* May 25-**89,** erection *E Rec* * Dec 14-**89**

BUENOS Ayres & Valparaiso Transandine, Jackson, inset *Inst C E* * v 109 -**92**

BUILDING, combination on Pac. coast, Ottewell, insets *Am C E* * Oct 27-**92**; construction, iron and steel, Fidler, bk., Griffin & Co., Lond. -**87**; history, Manners *Eng* * Jan 1-28 * Feb 5-26 * Mar 4, 11-**92,** do. *E Rec* Jan 30, Feb 13-27, Mar 5, 26, Apr -**92,** do. *Sc Am Sup* * Mar 12, 19 * Apr 16, 23 * May 7, 14, 28, Aug 6-**92**; in Am., T. Thomson, insets *E Mag* * Oct -**92**; rivets, conventional code for, Ferris, cor. *E News* * Jan 26-**89**; England and U. S., prices, Dec 15-**92**; erection, European methods *E Rec* * Mar 1-**90**; development, Trowbridge *Sc Am Sup* Mar 17-**88,** *N Y Acad Sci,* do. Swain *Soc Arts Mass* -**88**

BULL Creek, Paola, Kan., Kan. C. Fort Scott & Memphis R. *E Rec* * Mar 5-**92**

BUSSEY, Robbins *Tech Q* * Sep -**87**

CAIRO, Ohio river, Ill. Cen. R., substructure, inset *E News* * Feb 7-**91,** *R & Eng* Dec -**89,** *R Gaz* June 1-**88**

CAPUTH ferry, Tay river *Eng* * Sep 13-**89**

CASCADE, Sears, cor. *E News* Sep 1, Oct 6-**88**

CEREDO, Ohio river *E News* * May 17-**90**

CERNAVODA, Danube river, Roumania, proposed *E News* * Aug 23-**90**

CERVEYRETTE gorge, Briancon, France, inset *E News* * June 9-**92,** *Sc Am Sup* * May 21-**92**

CHATTANOOGA, Tenn., Walnut st., inset *E News* * May 16-**91**

CHENAB, Indian State R. *The Eng* Sep 14-**88**

CHESAPEAKE & Ohio, Ohio river, Burr, inset *Eng* * Dec 5-**90**

CHICAGO, Ogden Ave. viaduct, inset *E News* * Feb 6-**92**; draw-br., Madison st., inset *R Gaz* * Mar 11-**92**

CHICAGO, Bur. & Northern *E News* * Apr 7 * May 5, June 9-**88**

CHICAGO, Bur. & Q. R. standard double track *E Rec* * Oct 6-**88,** * Jan 26 * Feb 9-**89**

CHICAGO, Mil. & St. P. R. pin bearing plate girder *E Rec* * Nov 21-**91**

Bridges, CHICAGO & No. Western R. thin floor plate girder *E News* * Apr 9-**92**

CHICAGO & Western Indiana Belt R., 105-ft. double track through span *R Gaz* * Oct 30-**91**

CHITTRAVATI river, Madras R., India, Stoney *E Rec* * Apr 30 * Aug 6, 13 * Nov 12-**92,** and discuss., insets *Inst C E* * v 103, 104 -**91**

CINCINNATI & Covington elevated R. Transfer & Br. Co., river spans of, Burr, insets (full) *Am C E* * v 23 -**90,** (full) *Sc Am Sup* * Dec 13-**90**

CINCINNATI & Newport *E Rec* Sep 10, Nov 5 * 19 * Dec 31 etc. -**92**

CLARENCE, Taff river, Cardiff, So. Wales, inset *Eng* * Jan 30 * Feb 13, inset * Mar 6, inset * 20, 20-**91**

CLEVELAND central viaduct *E News* * Dec 22-**88**

CLYDE river, proposed *R & Eng* * Mar -**89,** * *Industries*

COFFER-dam or caisson without timber or iron in its construction, R. Harris, discuss., insets *Am C E* * v 24 -**91,** *R & Eng* May -**91**

COLORADO river cantilever, Cal. & Ariz. R. *E News* * Feb 23 -**89**

COLUMBIAN exhib. steel canal *E News* * Apr 21-**92**

COLUMNS, z-iron, expts., Strobel *Am C E, R Gaz* July 13-**88**

COMPRESSION members, Bess. steel, expts., Dagron, discuss., insets *Am C E* * v 20 -**89**

CONEMAUGH arch, Penn. Cen. R. *E News* * Mar 29-**90**

COTEAU, St. Lawrence river, Quebec, Can. Atlan. R. *E News* * Apr 12-**90,** machinery for swing span, inset * May 30, 30 -**91,** construction, Mountain, abs. *Inst C E* v 109 -**92,** *Can Eng* -**91.** See also BRIDGES, draw-bridges

CRIB, Salisbury & Haney R., N. B. *E News* * June 7-**90**

CRUEIZE viaduct, Marjevois, So. France R., n *R & Eng* * Mar -**91,** * *Genie Civil, The Eng* * June 5-**91**

CUMBERLAND, Md., Balt. st. *E News* * July 21-**92**

DALMARNOCK, Glasgow, inset *Eng* * Mar 28-**90**

DELAWARE, Lack. & W., White's plate girder *R & Eng* * July -**91**

DRAW-BRIDGES, swing, turning by elec. power *El Rev* * Apr 20-**89**; hydr. machinery, Fidler *Eng* Feb 19-**92**; end-adjusting gear for, Turner *E News* * Apr 16, vertical lift, method of operating * June 30-**92**; lock, Penn. R. *R Gaz* *

Bridges, DRAW-BRIDGES

July 27-**88**; protection, Boston, Rev. B. & L. R., Hammond, Oct 14-**92**

ARTHUR Kill, Staten Is. Rap. Tran. Co. *R Gaz* * June 22-**88**, approaches * July 26-**89**

BERLIN, Moltke iron tilt, Pinkenburg, abs. *Inst C E* v 92 -**88**

BRIDGEPORT, Ct., elec. operation *El Wld* * Apr 20-**89**

CASTLETOWN swing, Wawn, inset *Inst C E* * v 92 -**88**

CHICAGO river folding, *Eng* * July 24-**91**; swing by electricity *R Gaz* * Aug 21-**91**; Madison st., inset * Mar 11-**92**; Weed st., folding floor *E News* * May 23-**91**

COTEAU, St. Lawrence river, Quebec, Can. Atlan. R., machinery for swing span, inset *E News* * May 30, 30-**91**. See also BRIDGES, Coteau

DEE river swing, Manchester, Shef. & Lincoln R. *The Eng* * Nov 22, 29-**89**

DISMAL swamp canal, Norfolk & W. R., inset *E News* * Nov 3-**92**

DRYPOOL swing, Hull *The Eng* * Jan 3-**90**

DULUTH, Minn., ship canal, designs *E News* * Oct 27-**92**; lift, proposed, inset *R Gaz* * Apr 8-**92**

FLORENCE R., Tenn. river *E Rec* * Feb 28-**91**

FRASER river Howe truss, Can. Pac. R., Cambie *R Gaz* * Nov 25-**92**

GLAMORGANSHIRE canal swing, Cardiff *The Eng* * Aug 7-**91**

HACKENSACK, Erie R. *R Gaz* * July 20-**88**

HARLEM river lift, *R Gaz* June 10, temporary pile supports, Triest * Aug 19-**92**

KIDDERPORE docks swing *The Eng* * Apr 22-**92**

MANCHESTER ship canal swing *Eng* June 6-**90**

NANTICOKE river R., erection *E Rec* * May 16, 23-**91**

NEW London, Ct., Thames river *E News* * Aug 16-**90**

OAKLAND, Cal., accident *E News* * June 7-**90**

PAUMUNKEY river, erection *E Rec* * Feb 14-**91**

PETALUMA *E News* * Oct 13-**88**

POLLET swing, Dieppe, France *R Gaz* * Aug 26 * Sep 9-**92**, inset (full) *The Eng* * July 29 * Aug 5-19 * Sep 9-**92**

TARENTO, Italy *E News* * Sep 13-**90**

THAMES river, New London, Ct., pivot pier *R Gaz* * Nov 7-**90**

TIENTSIN, China R. *The Eng* Feb 3, 24-**88**

WINONA, Minn., swing span, inset *E News* * Oct 17-**91**

Bridges, DUFFERIN, Ganges river, Benares, Oude & Roh. R., India *Eng* * Feb 17, 17-**88,** Walton, Mar 7-**90**; construction, Walton *E Rec* Aug 22 * Dec 19-**91,** Jan 9, 30-**92**; Walton, discuss., insets *Inst C E* * v 101 -**90,** do. *The Eng* Mar 14-**90**

DULUTH, Minn., 6th ave. viaduct *E Rec* * Feb 20, 27, harbor entrance, proposed May 14-**92.** See also BRIDGES, draw-bridges, Duluth

DU VIAUR viaduct, proposed, inset *E News* * Nov 30, 30-**89**

EARN viaduct, Caled. R., Scot., renewal, inset *Eng* * Sep 16-**92**

ENGLISH Channel, proposed, Schneider *Eng* Sep 27-**89,** ed., Aug 7-**91,** * Sep 23-**92**; Talansier *E Rec* * Nov 2, 16-**89,** * *Genie Civil; F Inst* Nov -**89**; *R & Eng* * Nov -**89**; *R Gaz* Oct 11-**89**; Fleury *Rev des Deux Mondes* Aug 15-**92**; Schneider, Hersent, prelim. designs (very full) *Sc Am Sup* * Nov 2, 9, 16 * Dec 21, 28-**89** * Jan 25-**90,** do. *The Eng* * Sep 27 * Oct 4, 11-**89**

ENZ river, Hofen *Eng* * May 6-**92**

FLOATING, Portsmouth & Gosport, Harris *Eng* * Oct 7 *E Rec* Oct 15, *Sc Am Sup* * Nov 19, *The Eng* * Sep 23-**92,** *Inst M E*

FLOORS, wrt. iron double track floor-beam, Boller, discuss., insets *Am C E* * v 18 -**88**; do. *Sc Am Sup* * June 2-**88**; do. *The Eng* Apr 27-**88**; floor-beams and pine stringers for, Bates, dis., insets *Am C E* * v 23 -**90**; Hobson's flooring *Eng* * Nov 29-**89**; iron and ballast floor *E News* * Mar 23-**89** * Oct 27-**92**; solid R. *R Gaz* June 27, ed. Oct 31-**90,** shallow * Sep 11 -**91.** See also BRIDGES, railroad, floors

FOOT-bridges, Oker river, Brunswick, inset *Eng* * Aug 17, inset * Sep 7-**88**; Ouse river, Bedford *Sc Am Sup* * Sep 8-**88**; Kernot, cor. *The Eng* Aug 16 * Nov 15-**89**

FORTH, *Am C E* obs. on, Emery, insets * v 22 -**90**

Eng inset, * Apr 27, May 11, inset, 25, July 6, Aug 10, Cooper 31, Biggart, Dec 14-**88,** compared with Eiffel tower, May 3, inset, Nov 15, inset, 29, Dec 6-**89,** history, Westhofen (very full des.), insets * Feb 28, ed. Mar 7, assessable valuation, Oct 3-**90**

E Mag greatest in world, Clarke * Apr -**91**

E & Min * Mar 15-**90,** * *Industries*

E News * Mar 10, Cooper * Sept 22-**88,** * Feb 9, determination of wind pressure by model, n Mar 16-**89,** inset * Jan 25, 25, testing, Feb 15, notes, Mar 15, final inspection report, Mar 29-**90,** criticisms, Cooper, cor. Lindenthal, Dec 5-**91**

Bridges, FORTH

E Rec Baker * Oct 12-**89**; construction * Sep 6-**90** * Jan 10-**91**

Inst C E hydr. appliances at works, Moir, inset * v 91 -**88**, Austrian prototype of Köstlin, abs. n v 92; Queen's ferry, Nott *Locom* June -**90**

R & Eng description * Feb -**90**

R Gaz Biggart * May 18, erection * July 13, discuss. on bridge steel, Cooper, Sept 14-**88**, *Iron & Steel Inst* Brit. * Nov 15-**89**, *Industries* Oct 11-**89**, wind pressure obs. *R Gaz* Apr 18-**90**

Sc Am Sup Cooper * Oct 13 * Nov 17-**88**, Jan 19-**89**

The Eng Feb 3, Aug 24, Oct 19, 19, Nov 9, 9-**88**, * Jan 11, July 26 * Aug 2, 23, 23, inset * Dec 13-**89**, * Feb 28, opening, Mar 7, Ry 14-**90**

FORT Madison, Miss. river, inset *Eng* * July 19-**89**, *Sc Am Sup* * Aug 31-**89**

FORT Smith R., Ark., piers *E Rec* * Oct 22-**92**

FOUNDATIONS, design, H. Lewis *E News* Oct 17-**91**; repairing, Wash. aqueduct, D. Hunt *E Rec* * Dec 27-**90**; piling vs. mud-sills, Cantine *R Gaz* Sep 9-**92**. See also FOUNDATIONS

GAGNIERES viaduct *R & Eng* * May -**89**

GARABIT viaduct *E Rec* * Mar 7-**91**; Eiffel, abs. *Inst C E* v 95 -**89**, *Compt r* July -**88**

GIRDER, fundamental types of metallic and the cantilever system, Gaudard, abs. *Inst C E* v 106 -**91**, *An Ponts* Mar -**91**; girder tests, Austrian, mild steel *R Gaz* * Nov 27-**91**; girder flanges, lateral stability of *The Eng* * May 29-**91**. See also BEAMS and girders

GLAMORGANSHIRE canal swing, Cardiff *The Eng* * Aug 7-**91**

GLASGOW harbor high level, proposed *Eng* Jan 11-**89**; Glasgow Cen. R., inset * Aug 19-**92**. See also BRIDGES, highway, Glasgow; Railroads, underground, Glasgow Cen.

GLENURY viaduct timber arch *E Rec* * Nov 12-**92**, *Eng*

GREENOCK & Gourock R., inset *Eng* * Feb 22-**89**

GROUSE valley R. *E Rec* * Jan 19-**89**

GOUR Noir viaduct, Vegere river, Uzerche, France, inset (full) *E News* * Aug 18-**92**

HACKENSACK draw-bridge, Erie R. *R Gaz* * July 20-**88**

HARLEM river, N. Y. *E News* * May 26-**92**; *E Rec* * Jan 21, erection * July 7-28 * Aug 11, Sep 1-**88**; lift *R Gaz* June 10,

Bridges, HARLEM
temporary draw-br. pile supports, Triest * Aug 19-**92.** See also BRIDGES, draw-bridges, Manhattan

HAWARDEN, Dee river, Fox *E News* * Sep 15-**92,** inset *Inst C E* * v 108 -**92**

HAWKESBURY R., New So. Wales, Burge *Eng* Mar 7-**90**; motions, observed in, Ewald, cor. * Feb 6-**91,** do. *E News* * Mar 14-**91**; Jan 5, testing, July 20-**89**; erection *E Rec* * May 30 * June 6-**91**; Burge, insets *Inst C E* * v 101 -**90**; placing the center span *R Gaz* * Aug 10-**88**; *Sc Am Sup* * Aug 11-**88**; *The Eng* Sep 7-**88,** June 14, Sep 13-**89,** Burge Mar 7-**90**

HIGHWAY, Cincin. cantilever, Kaufman, insets (very full) *Am C E* * v 27 -**92**; Glasgow road, Grt. West. R., inset *Eng* * Aug 22-**90**

E News Waterford, N. Y. * June 1; iron viaducts for, Waddell, 8; * July 6-**89**; supervision, proposed system, Stowell, Mar 22, 29; legislation, proposed, Breithaupt, cor. Apr 19; designs, Owen, cor. May 10; the bridge of the future, Dibbles * June 21; Guilderland, N. Y. (unsafe), Stowell, cor. * Aug 30; wire suspen., Victor, Cal., etc. * Nov 8-**90**; plate girder, Brookline, Mass., inset * Sep 19-**91**; Rockford, Ill., State st. plate girder, inset * Feb 27; Stearns truss for * July 21-**92**

E Rec viaducts across R. tracks, Gayler, Sep 19-**91,** do. *J Assoc Eng Socs*, iron and steel, Waddell, discuss. Nov -**88,** abs. *Inst C E* v 95 -**89**; floors of st., Gayler, abs. v 93-**88,** *J Assoc Eng Socs* -**88**; Kelvin river road, Glasgow *R & Eng* * Nov -**91**; Niemen river, Olita, Russia * Dec -**92**; 158th st., over N. Y. Cen. R. *R Gaz* * Nov 9-**88**; Nova Scotia * May 3-**89**; over R. tracks, experience with, Gayler, Aug 21 -**91**; brick, Persia *Sc Am Sup* * Dec 31-**92**

HOOGHLEY river Jubilee R., India, Leslie *Eng* Jan 27-**88,** erection *E Rec* * Oct 4, 25-**90,** do. discuss., inset (full) *Inst C E* * v 92-**88,** do. *The Eng* Feb 10-**88**

HOWE truss, timber, Willamette river, Albany, Or. *Eng* * Jan 6-**88**; timber structures, western Am. 180 and 250-ft. span, inset * Oct 7-**92**; determination of length of strut, D'Armit, cor. *E News* * Nov 16, 23, strut prob. Dec 14-**89**; Or. Pac. R., strain sheets, inset * Apr 26, 26; 50 and 68-ft. spans, Can. Pac. R. * May 24-**90**; R., Jameson *R & Eng* * Mar * May * June * Aug * Sep * Oct * Dec - **90** * Jan * Feb -**91**; Willamette

Bridges, HOWE
river, timber, Albany, Or. *R Gaz* * Apr 19-**89,** *Sc Am Sup* * Mar 17-**88,** *Eng*
HUDSON river, first design, Pope's flying lever, 1811 *R & Eng* * May -**88**; tunnel, ed. *E News* May 31-**90**
INDIA, bridging alluvial Punjaub rivers, ed. *Eng* Jan 31, notes, Feb 14, Mar 28-**90**; Chittravati, discuss., insets (full) *Inst C E* * v 103, 104 -**91.** See also BRIDGES, Chittravati — Hooghley river — Sukkur
IRON, wts. of, formulas, Beatty *Lehigh Eng J* June -**88**
JERSEY City, Harsumn's Cove transfer, Benset, insets *Am C E* * v 19 -**88**
KANAWHA river *E Rec* * Aug 17, 31 * Sep 14, 28 * Oct 5, 19, 26 -**89**
KENNEWICK, No. Pac. R. *R Gaz* * Nov 8-**89**
KENTUCKY river, or Tyrone cantilever, inset *E News* * Apr 5-**90**; Irvine, Ky., erecting * May 26-**92**
KENTUCKY & Indiana, Louisville *Eng* * Jan 27-**88**; Moulton, abs. *Inst C E* v 92 -**88,** *Am C E* Sep -**87**
KINGPOST truss, wrt. iron shoe for, Cin. N. Or. & Tex. R. *E News* * Apr 6-**89**
KINZUA viaduct, J. Clarke *Am M E* * v 11-**90**; 1882, T. Clarke *E News* July 5, n, Aug 30-**90**
LAGAN, Belfast *The Eng* * Aug 22, 29, 29-**90**
LANSDOWNE, at Sukkur, Indus river. See BRIDGES, Sukkur
LOA viaduct, Antofagasta R., Bolivia 336 ft., highest in world *E News* * May 18-**89,** *R & Eng* * June -**89,** *Sc Am Sup* * Mar 15-**90,** *The Eng* * Apr 19, 19, inset * 26-**89**
LONDON, England, Blackfriars, Thames river, Lond. Chat. & Dover R., Cruttwell, discuss., inset *Inst C E* * v 101 -**90,** *The Eng* Mar 21-**90**
THAMES river, proposed *E Rec* * Nov 19-**92,** do. Ratcliffe to Rotherhithe, and ed. *The Eng* * Oct 28, 28-**92**
TOWER. See BRIDGES, Tower, London
LONG span, discussion of, Lindenthal *E News* * Mar 3, 10, 24; very long span, proposed design, Warren * June 30-**88**; and North river, N. Y., Lindenthal, Nov 9, 16, 23-**89**; table *R Gaz* May 2-**90**
LYONS, Rhone river, Nansouty, abs. *Inst C E* v 106 -**91,** * *Genie Civil* v 19 -**91**; great, Fournere & Croix, Rousse *Sc Am Sup* * Oct 24-**91**

Bridges, MALLECO viaduct, Chili, Mamy, abs., inset *Inst C E* * v 104-**91** *Genie Civil* * v 18 -**91**
MANARVATER timber viaduct, New Zealand *E Rec* * Jan 4-**90**
MANHATTAN, Harlem river, N. Y. *Eng* * May 4-**88,** *E News* * Feb 4, Sep 8-**88.** See also BRIDGES, Wash.
MARBLE Creek viaduct *E Rec* * Apr 18-**91**
MARENT Gulch high viaduct, No. Pac. R. *R Gaz* * Apr 26-**89**
MARGHERITA, Rome *R & Eng* * June -**92,** *Industries;* Turin, Po river, abs. *Inst C E* v 92 -**88,** *Giornale Civ* -**87**
MASONRY, with semi-free joints, Cunningham *Eng* * May 6, *Sc Am Sup* * June 25-**92,** *An Ponts*
MATTABESSETT river, E. Berlin, Ct., inset *E News* * Apr 2-**92**
MAUCH Chunk suspension, Hildebrand *E News* * Feb 25, Mar 10-**88**
MEMPHIS R., Miss. river, Tenn. *E News* * May 12, inset * June 16, inset * Sep 15-**92**; erection *E Rec* June 20 * July 25 * Oct 17-31 * Nov 7-**91** * May 14-**92**; and ed. *R Gaz* * Feb 21 -**90,** June 26-**91** * May 13-**92**; *The Eng* Aug 3-**88**
MICHIGAN Cen. standard, with 3 inside guard rails *R Gaz* * Nov 1-**89**
MISSOURI Pacific, inset *E News* Feb 14-**91**
MOLDAU viaduct, at Cervena *E News* * Apr 19-**90**; Huss, abs., *Inst C E* v 98 -**89** * *Woch ost Ing* -**89**
MONTREAL, proposed *E News* May 31-**90**
MORAND, Rhone river, Lyons *The Eng* * Oct 16, 23, 30-**91**
NEEDLES, cantilever, Col. river, Cal., Atlan. & Pac. R., inset *R Gaz* * Apr 25-**90**
NEWARK Dyke, Grt. Northern R. *The Eng* * Mar 7, 21-**90**
NEW Brunswick, N.J., Albany st. masonry arch *E News* * Apr 16-**92**
NEW London, Ct., Thames river. See BRIDGES, Thames river
NEW Orleans, Miss. river, projects *R Gaz* * May 16 * July 11-**90**
NEWPORT viaduct, Isle of Wight, inset *Eng* * Jan 25-**89**
NEW York Cen. double track with solid plate floor *R Gaz* * May 17-**89**
NEW York and N. J., Clark report, inset *R Gaz* * Sep 23 *Sc Am Sup* Oct 22-**92.** See also BRIDGES, Harlem, Manhattan, North river, railroad, Washington, etc.
NEW York, Prov. & Boston ballast floors *E News* * Mar 1-**90**
NEW York Rapid Transit R. viaduct, proposed *E News* * Oct 31-**91**

Bridges, NEW York Terminal R., Hudson river, proposed *E Rec* * Jan 14-**88**
NIAGARA suspen., towers reconstruction, Buck, *Am C E* v 17 -**87,** abs. *Inst C E* v 93 -**88**
NORFOLK & Carolina transfer, inset *E News* * Jan 30-**92**
NORFOLK & Western standard plans *E News* * June 23, 28-**88**
NORTH river suspen., N. Y., proposed, Macqueen *Cosmop* Aug -**92**; Lindenthal *Eng* * May 9-**90**; and world's great *E News* * Jan 14, 14, discuss. of long span bridges, Lindenthal * 28, 28, Feb 4-**88**; July 20-**89**; Lind. reply *E Rec* July 20-**89**; *Sc Am Sup* * Nov 7-**91,** *R Rev;* Lindenthal's project, criticism, Ende *The Eng* * May 17, Lind. Aug 30-**89**
OAKLEY skew, Cin. & Rich. R., design and erection Crowell, insets *Am C E* * v 23 -**90**
OHIO, Cin. & Covington Elevated R., Burr, *Am C E* v 23-**90,** abs. *Inst C E* v 103 -**91**
OHIO Connecting R., Pitts, Pa., floating 523-ft spans into place, inset *E News* * Sep 20, false works * 27-**90,** do. (full) *E Rec* * Sep 13, erection * Dec 13-27-**90** * Jan 3-**91,** Strobel, abs. *Inst C E* v 103 -**91**; inset *R Gaz* * June 20, Aug 22, inset * Sep 12-**90**
OHIO river, completion of, *E News* Jan 12-**89**
OMAHA, erection *E Rec* * Mar 9, 16-**89**; suit *R Gaz* July 31-**91**
ORISKANY, N.Y., Cen. & Hud. R. R., inset *E News* * Dec 7-**89**
OSCHUTZ viaduct *R & Eng* * May -**88**
PADERNO viaduct, Adda river, Sacheri, abs. *Inst C E* v 98 -**89** * *L'Ingeg Civile* -**89,** *R Gaz* * Sep 14-**88**
PALATINE, Tiber river, Rome *R & Eng* * Mar -**92**
PARALLEL-chord, tables for finding stresses in, Hitchcock, inset *E News* May 23-**91**
PASSENGER ferry, N.Y. L. Erie & W. R. *E News* * Apr 6, cor. 20-**89**
PATIALA-Bhatinda R., iron-work *The Eng* Nov 16-**88**
PECOS river, Southern Pac. R., Tex. *E News* * Feb 6-**92**
PENCOYD shop *E Rec* * July 27 * Aug 3-**89**
PENN. R. frt. car transfer, Jersey City, inset *E News* * Jan 18, 18 -**90**; draw-bridge lock *R Gaz* * July 27-**88**
PHILADELPHIA, Market st. cantilever, Amweg *E News* Apr 7-**88**
PIERS, Red river concrete, Purdon *E News* * June 2-**88**; French masonry and detail * Sep 5-**91**; Stettin, Ger., masonry removal * July 14; screw piles for * Aug 4-**92**; moments, graph.

Bridges, PIERS
method of obtaining, Lindenberger *F Inst* * Nov -**89**; and river crossings, Otagawa *R & Eng* * Nov * Dec -**88,** Jan -**89**; repairing under water, Rossignol * Sep -**90,** *An Ponts*
PILE and trestle, Robinson *E News* Apr 7-**88.** See also BRIDGES, railroad; PILING; TRESTLES
PINS, fibre strain in, J. Johnson *E News* * Jan 28, Du Bois, cor. Mar 10, strains in, Fowler, cor. * 24; and eye-bars, proportions, Stowell, Mar 31-**88**
Po river, at Casalmaggiore, Parma-Brescia R., erection *E Rec* * May 5-26-**88,** abs. *Inst C E* v 95 -**89,** *L'Ingeg Civil* -**88**
POLLET swing. See BRIDGES, draw-bridges
PONTOON, Indian boat, Fenner *R & Eng* * Sep -**88**
PONY lattice, N.Y., West Shore & B. R. *R Gaz* * Sep 21-**88**
PORTABLE, Brochocki's *Eng* * Apr 5; Paris exhib. * Aug 2-**89**; *E News* May 26 * Sep 1-**92**; French iron, Talansier *E Rec* * Jan 12-**89** * *Genie Civil;* metallic, for quick erection, Pichault, abs. *Inst C E* v 91 -**88,** *Assoc Ings Liege* -**87**
PORTAL bracing, anal. of stresses, Cain *E News* July 13-**89**
PORTSMOUTH & Gosport floating, Harris *Eng* * Oct 7, *E Rec* Oct 15, *Sc Am Sup* * Nov 19, *The Eng* * Sep 23-**92,** *Inst M E*
POUGHKEEPSIE, cantilever, Hudson river, construction, O'Rourke, insets (full) *Am C E* * v 18 -**88,** inset *E & Min* Feb 2-**89,** *E News* Jan 7-**88** * Feb 16-**89,** abs. *Inst C E* v 96 -**89,** T. Clarke *Sc Am Sup* * May 19-**88,** *The Eng* Sep 21-**88**
PROVIDENCE, R.I., Point st., guard gates, Bullock, insets *Am C E* * v 20-**89,** *E Rec* * Nov 28-**91**
QUERETARO aqueduct, Mexico *E News* * June 2-**88**
QUINDARO, caissons and cribs, inset *E News* * Apr 4-**91**
RADIAL truss, F. Smith, cor. *E News* * Apr 11-**91**
RAILROAD, wts. of, Du Bois, inset, new form of strut, Strobel *Am C E* * v 18-**88**; Am., Cooper, discuss., insets (very full) * v 21, 21 -**89**; R. bed for bridge structures, Woolson *Am M E* * v 9 -**88**; bridging canons lengthwise, Hinckley, inset * v 26-**92**; Burge, Walton, Cruthwell *Eng* Mar 7-**90**; Am. viaducts, Greiner * Aug 14-**91**; Glenury viaduct renewing in Scot., Caled. R., inset * Sep 2, Earn viaduct * 16-**92**; Am., Cooper, (full) *E & Min* * Oct 5-26 * Nov 2, 9, 30-**89,** do. *E News* * July 6-**89**; Am., origin and evolution, Greiner * June 6-**91**; use of steel for, symposium, Mar 26, Apr 2, Aug 25-**92**; wrt.

Bridges, RAILROAD
iron floor beam, test, Boller *E Rec* * Dec 10-**87**; new form of strut, Strobel, abs. *Inst C E* v 95-**89**; Dufferin, Hawkesbury, discuss., insets (full) * v 101 -**90**; Am., origin and evolution, Greiner *R Gaz* * June 5-**91**; recent construction of, Ritchie *Sc Am Sup* Jan 17-**91**, *J Assoc Eng Socs*; spacing cross-girders in, MacKensie *The Eng* * Mar 6-**91**; Moenchenstein failure, Switz., Ende * Feb 19-**92**. See also under BRIDGES, Howe truss, and names of places and railroads, Forth—Loa—London, Blackfriars—Oakley, etc.; PILING; TRESTLES
DESIGNING, disputed points in, Waddell, discuss., insets (very full) *Am C E* * v 26 -**92**, *E News* Dec 12, 26-**91**, *E Rec* Dec 12, 26-**91**, Jan 9-**92**, *R Gaz* Oct 14, 28, Nov 4, 25 -**92**
GUARDS, inside and outside, Dailey *E News* * Jan 28, 28-**88**; rerailing, Buf. Roch. & Pitts. * Sep 13; guard rails, McNicol, cor., ed. * Oct 4, 4-**90**; St. R., Holland * Mar 7; Cleveland rerailing guard * Apr 11-**91**; Dutch St. R., Post *R & Eng* * Apr; the Tilden * Sep -**91**; Sav. Fla. & W. standard *R Gaz* * Jan 17; and rerailer, Plant system * 31-**90**; location of guard rail * Feb 6-**91**
LEGISLATION *E Rec* Jan 16, 23-**92**
LOAD diag. for stresses in asimont *E News* * Mar 10-**88**; panel concentrations due to engine loads, Szlapka, cor. Dec 6-**90**
RERAILER, Locke's protector *E News* * Dec 27-**90**; Cleveland rerailing guard * Apr 11-**91**; Post's *R Gaz* * Mar 13 -**91**. See also BRIDGES, railroad, guards
STRAINS, produced by loaded cars of 90,000 lbs. capacity, Blakely cor. and ed. *E News* May 10-**90**. See also BRIDGES, strains and stresses
TIMBER structures, western Am. *Eng* * Sep 23, Howe truss 180 and 250-ft. span, inset * Oct 7-**92**
RAO Shri Pragmalji, Mandvi, Kutch, Sykes *Inst C E* v 103-**91**
RED river concrete piers, Purdon *E News* * June 2-**88**
RED Rock cantilever, Col. river, At. & Pac. R., foundations *E News* * Sep 27; Waddell, inset detail sheet * Oct 4, 4, correction, 11-**90**; Rowe *E Rec* Dec 19, 26-**91**, erection * May 7 * July 2-**92**, *Am C E*; abs. *Inst C E* v 103 -**91**
RIPARIA, Snake river, Wash. T. *Eng* * Nov 6, *Sc Am Sup* * Dec 19-**91**

Bridges, RIVERMONT, Lynchburg, Va. *E News* * Feb 21-**91**
ROCHESTER, N.Y., Driving Park ave., Genesee river *E Rec* * July 18 * Aug 1, *R Gaz* * July 17-**91**
ROCKFORD, Ill., State st. plate girder highway, inset *E News* * Feb 27-**92**
ROPE and military applics., Gisclard *Sc Am Sup* * Oct 17-**91,** *Genie Civil*
RULO, report, Morison, bk. review *R & Eng* Feb -**91**
ST. Guistina viaduct, So. Tyrol, inset *E News* * Feb 1, 1-**90**
ST. JOHN cantilever *E Rec* * Mar 16, 30-**89**
ST. LAWRENCE river, Lachine, Can. Pac R., inset *Eng* * Apr 13 -**88**
ST. Louis, Mo., Merchant's, Miss. river, inset *Eng* * May 15, inset * June 5, 5, inset * 12-**91,** inset *E News* * Dec 21, 21 -**89**; Grand ave., inset * July 18-**91**; Maline Creek * Feb 20 -**92**; Grand ave (suspen.) *E Rec* * June 6, 20, 27 * July 4 * Aug 8-29 * Oct 3, 10-**91**
ST. Mary's Falls, Sault Ste. Marie, wind strains on, diags. *E News* * May 25-**89**; Massy * Oct 18-**90**; canal and dam *E Rec* * Mar 22-**90**
ST. Paul, Minn., Miss. river high br. *E Rec* * Feb 16, 23, Mar 2 * Apr 6 * May 11 * July 20, erection * Dec 21, 28; Col. st. skew arch * Nov 23-**89**; Wabasha st., erection * Dec 26-**91** * Jan 16-**92**
ST. Peters, Dadore river *E Rec* Aug 10-**89**
SIBLEY, Missouri river, Chic. S. F. & Cal. R., Chanute, discuss., insets (full), construction, Wallace, superstructure, Breithaupt *Am C E* * v 21, 21-**89,** *Eng* July 5, 5-**89,** *E News* * Feb 18-**88,** abs. *Inst C E* v 99 -**90,** (dates) n *R Gaz* Feb 17-**88**
SIEE Ho, China R. *The Eng* Feb 3-**88**
SIOUX City, Monson report, pph. *R & Eng* * May -**91,** *R Gaz* Oct 3-**90**
SKEW portals *E News* Apr 27, Leschorn, cor. * May 18-**89**
SKIPTON & Ilkley, England *The Eng* June 15, 15-**88**
SOULEUVRE viaduct, France, Vire, St. Lo. & Caen R., piers *E News* * June 28-**90,** *E Rec* * Jan 10, 17-**91,** *Genie Civil, R & Eng* * Mar, *Sc Am Sup* * Apr 5, *The Eng* * Jan 24-**90**
SMITHVILLE, Mo., Chic. Kan. C. & Tex. R., inset *E News* * Jan 24-**91**
STAGING for girders bridges *The Eng* June 1-**88**
STARRUCCA viaduct, N.Y. L. Erie & W. R. *E News* * Sep 1-**88**

Bridges, STEEL compression members, strength, expts., Dagron *R Gaz* Jan 6-**88,** *Am C E* -**87**

STEUBENVILLE, P. C. & St. L. R., temporary support, renewing pier *E News* * July 12-**90**

STOCKTON-on-Tees, Victoria br., Neate *E News* * Sep 8-**92,** *Inst C E*

STONE. See ARCHES; BRIDGES, arched and names

STRAINS and stresses, Booth *Am C E* v 20 -**89**; greatest truss stress and position of load, etc., Eddy, inset (very full) * v 22 -**90**; slide moment diag. for computing, Greiner *E News* Apr 14; web stresses with curved chords, Lindenberger, cor. * 21 -**88**; safe stresses in, Ottewell, diag. * Feb 23; allowable strains in old, Fowler, cor. Apr 6; strains cal. by graph. method, Baldwin, diag. * Sep 28 * Oct 12-**89**; device for cal. strains, Howe, Jan 11; mechan. comput. of stresses, Fletcher * Mar 1, May 10, do. Webb, cor. * Apr 12; strains produced by loaded cars of 90,000 lbs. capacity, Blakely, cor. and ed. May 10; method of cal. strains in Whipple truss, W. Baldwin (math.) * Aug 30-**90**; computing strains, German practice, Waddell Dec 12-**91** * Feb 27-**92**; secondary stresses in framed structures, Hiroi *R & Eng* * Oct -**88**

STREET'S Run viaduct, Pitts. Vir. & Charleston R. *E Rec* * Mar 26-**92**

SUBAQUEOUS viaduct *E News* * Feb 28-**91**

SUKKUR cantilever, Indus river, Parsey, inset *Eng* * Mar 9, 9-**88,** inset * Jan 4-**89**; erection *E Rec* * Apr 9-23-**92**; the Lansdowne, Robertson, insets *Inst C E* * v 103-**91,** do. *The Eng* * Jan 9-**91**

SUSPENSION, and flume for lumber transport, Cal. *E News* * Apr 11-**91**; proposed new system, Steiner, cor. * Mar 12-**92.** See also under Bridges, names.

SUSQUEHANNA river, Phil., Harrisb. & Pitts. R. *R Gaz* * Feb 12 -**91**

SWISS No. Eastern standard plate girder *E News* * Mar 26-**92,**

TARANTE, Italy, n *Sc Am Sup* * Jan 14-**88**

TAVISTOCK & Shillamill viaducts, Plymouth & S. W. Junction R., England *The Eng* * June 6-**90**

TAY viaduct, Dundee, Barlow *Eng* May 18-**88,** discuss., insets *Inst C E* * v 94 -**88,** construction, Inglis *R Gaz* June 29-**88**

TESTING, Nansouty, Cuenot, abs. *Inst C E* v 108 -**92,** *Genie Civil* * v 19 -**91,** *An Ponts* July -**91**

Bridges, THAMES river, New London, Ct., N. Y. Prov. & Boston R., inset *Eng* * Apr 10 * May 8, 15-**91**; *E News* May 19-**88**; *E Rec* * Oct 11, 18-**90**; *R & Eng* * June -**88**, Nov -**89**, report, Nov -**90**; draw-br. pivot pier *R Gaz* * Nov 7-**90**; lower single span, opening, proposed *The Eng* * Mar 18-**92**. See also BRIDGES, draw-bridges

TIDE-water Pipe Co. suspen., Mauch Chunk, Pa. *E News* * Feb 25-**88**

TIMBER rolling-br., in Drowtheim, Cauer, abs. *Inst C E* v 92 -**88**, *Zeit Bauwesen* -**87**

TORKHAM, India, launching of, Ollenbach *The Eng* Jan 13-**88**, *Ind Engr*

TOWER, London, inset *Eng* * Sep 23-**92**; *E News* * July 6-**89**; *E Rec* May 21-**92**, *R & Eng* * Oct -**90** * Oct -**92**, * *Industries; The Eng* * Aug 16, 30, 30, Sep 6, 6 * Oct 18, 18 * Nov 8, 8, 15 * Dec 20, 20-**89** * Apr 17-**91**

TRANSANDINE, inset *Eng* * Dec 2-**92**

TRANSFER, Harsimn's Cove, Jersey City, Bensel, discuss., insets *Am C E* * v 19 -**88**

TRESTLES. See TRESTLES.

TRUSSES, formulas for wt. of, Du Bois *Am C E* * v 18-**88**; abs. do. *Inst C E* v 96-**89**; failures in 1889 and for 11 years, ed. *E News* Apr 19, 19; arch, Gilman, Aug 16-**90**; truss deflection, J. Johnson *R Gaz* Aug 1-**90**

TURIN, Po river, Margherita, abs. *Inst C E* v 92 -**88**, *Giornale Civ* -**87**

TWO Medicine, Great No. R., St. Paul, Minn. & Manitoba R *E News* * Mar 19-**92**

TWYFORD viaduct, Didcot, Newbury & Southampton R. *The Eng* * Dec 18, 25-**91**

VAN Buren, Ark. river, construction, Purdon, discuss., insets (full) *Am C E* * v 20 -**89**, piers erection, do *E Rec* * Jan 11-**90**

VANDEVANDA, Penn. R. *E News* * Jan 12-**89**

VERRUGAS viaduct, Oroya R., Peru, inset *Eng* * Apr 17; Olcott *E & Min* * Jan 24-**91**; *E News* * July 27-**89** * May 9-**91**

VIAUR, Du., viaduct Carmaux & Rodez R., proposed, inset *E News* * Nov 30, 30 *R & Eng* * Nov, *Genie Civil; The Eng* * Dec 27-**89**

VICTORIA, Stockton-on-Tees, Neate, inset *Inst C E* * v 109 -**92**; Kilmarnock *The Eng* Aug 30-**89**

VIENNA, Stephanie, Danube canal, abs. *Inst C E* * v 92 -**88**, *All Bauz* -**87**

Bridges, WASHINGTON, Harlem river, 181st st., N. Y. city, W. Hutton (bk.) *E & Min* * Sep 27-**90**; designs, inset *E News* * Dec 27-**90**; (Manhattan bridge) Hutton, bk. n *E Rec* Jan 31-**91**

WEEHAWKEN viaduct and pass. elevators, T. Brown, Blakeley, insets *Am C E* * v 27 -**92**, inset *R Gaz* * Jan 22-**92**

WEIGHTS of, DuBois, inset *Am C E* * v 18-**88**; formulas, Mosscrop *E News* Mar 17-**88**

WHARFE river, Yorkshire *The Eng* May 25-**88**

WHITE'S plate girder, Del. Lack. & W. *R & Eng* * July -**91**

WILLAMETTE river Howe truss timber, Albany, Or., Or. R. & Nav. Co. *R Gaz* * Apr 19-**89**, *Sc Am Sup* * Mar 17-**88**, *Eng*

WINNER, Kansas City, Mo., details, inset *E News* * Mar 15, inset * July 19, 19-**90**

Bridging canons lengthwise, Hinckley, insets *Am C E* * v 26 -**92**

Bright, Charles T. (full) *El Rev Lond* May 11, *Inst C E* v 93 -**88**, por. *Sc Am Sup* * July 7, *The Eng* May 11-**88**

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LOS Angeles, Cal. *Eng* * Aug 28–**91**; cable viaduct *E News* * Jan 25–**90**; Nov 7–**91**; single-post viaduct, Hawgood, Temple st., Wood, inset *Inst C E* * v 107 –**92**; *Sc Am Sup* * Oct 10–**91**; *St R J* * Mar, Temple st. Co. * Sep –**90**
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MT. Vesuvius, Zanetti, n *St R J* * Mar –**91**
MULLER traction system *St R J* * Dec –**92**
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VOGEL system, conduit and grip *E News* * Jan 31-**91**
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Caffeine, action of (full) *Sc Am Sup* June 21-**90**. See LAPICQUE
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Calculation, mental, Bidder, Pole *Inst C E* v 103 -**91**, remarkable feat of, do. *E News* Sep 19-**91**; multiplication, quick method, Fuller, cor. Jan 30-**92**
Calendar, perpetual, McFarland's *Sc Am Sup* Apr 11-**91**; old style and new (reckoning) *Locom* Oct -**90**
Calorimeters, simple, Peabody *Am M E* v 10 -**89**; errors of different types, do., an universal, Barrus * v 11, 11-**90**; notes, Carpenter * v 12 -**91**; Barrus' universal *E News* * May 31-**90**; new, Peabody F *Inst* * Aug -**88**; for testing fuels on a small scale, Donkin *Inst C E* * v 102 -**90**, do. *The Eng* * Jan 9-**91**; Heisler throttling *Pwr* * Feb -**91**; steam, for locom. use, ed. *R Gaz* Jan 22-**92**; Peabody *Tech Q* Oct -**88**, errors, expts., do. Feb -**90**
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FRANCE, cost of motive power on, *E News* June 14-**90**; river and other works, Vernon-Harcourt, discuss., insets (full) *Inst C E* * v 96 -**89**; internal nav. in *R & Eng* Jan -**90.** See also CANALS, Havre
GANGES, lower, failure of Kali Nadi aqueduct, Thelnall, abs. *Inst C E* v 95 -**89,** construction, Good, inset * v 105 -**91**
GERMANY, Belgium, France, river and other works, Vernon-Harcourt, discuss., insets (full) *Inst C E* * v 96 -**89**
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GREAT Western ship, England, proposed, map *Eng* * Oct 12-**88**
HAGUE, renewal of water in, Pichler, abs. *Inst C E* v 95 -**89,** *Woch Ost Ing* -**88**
HAVRE to Tancarville, Widmer, abs. *Inst C E* v 110 -**92,** *An Ponts* May -**92**; *Sc Am Sup* * Sep 15-**88,** *La Nature*
HUDSON river ship and great lakes, North *E News* May 5, *Forum* May -**92.** See also CANALS, Lakes
INDIA, ed. *Eng* Oct 14-**92**
JURAPA irrig., Finkle *E News* * May 17-**90**
KIOTO & Lake Biwa, Japan *Eng* * Jan 25-**89**
LAKES, Erie & Ohio river ship, proposed *E News* * Mar 21, do. *R Gaz* Apr 10-**91**; Great lakes & Atlantic seaboard enlarged waterway, Corthell *Eng* July 17, 24, do. *E News* Apr 18 * 25, do. (very full) *Sc Am Sup* July 4-**91,** *J Assoc E Socs*; Superior & Mich., proposed, maps *E News* * Mar 22-**90**
LIFTS, hydr., Prussman's *Eng* * Oct 14-**92**; lifts on, Harcourt *E News* Aug 4-**88**; hydr., Belgium *R & Eng* * Mar -**89,** *Genie Civil*
FONTINETTES, France, hydr. *E & Min* * Sep 29-**88,** * *Industries*, vertical, Hoppe system, Petri *E News* * May 9, 23 -**91,** *E Rec* * June 23 *R Gaz* * Sep 28, *Sc Am Sup* * Sep 29 -**88,** *The Eng* * Dec 21-**88** * Jan 11, 25 * Feb 15-**89**

Canals, Lifts, LA Louviere, Belgium, hydr. *Eng* * Oct 12, *The Eng* Dec 21, 21–**88** * Jan 25, 25–**89**

LIVERPOOL & Birm. See CANALS, Birmingham

LOCKS, accident, Sault Ste Marie *E & Min* * Aug 30–**90**; of 20 metres (65 ft.) lift, Fontaine's *E News* * Sep 19–**91**; Cascades *E Rec* * Oct 8, 15; gates, distrib. of beams in, Stoney *The Eng* * Apr 1; adjustable and weir, Hale, cor. * May 6–**92**

MANCHESTER ship, ed. *Eng* June 8, 15, 29, July 20, Sep 7, 21, Oct 5, ed. Dec 21, 28–**88,** Apr 25, Wins * Aug 29 * Dec 5–**90** * Jan 16 * Feb 13, 27 * Mar 13, 27 * Sep 11 * Oct 2, ed. Dec 4–**91**

E Mag Dunell * Nov, Dec –**91**; and Corinth *E News* June 30, July 28, Aug 4 * Sep 29–**88,** profile * Jan 11–**90**; *E Rec* * Sep 29 * Nov 17, Dec 8, 15–**88,** Feb 16 * June 8, 15, July 27 * Sep 7 * Oct 5, 26–**89**; mechan. appliances, Wins, insets *Inst M E* * July –**91**; Harrison *Locom* Dec –**89**; *R & Eng* * Oct –**90**; *R Gas* Sep 14–**88,** Hansel, map * Aug 19–**92**; Wells *Sc Am Sup* Feb 16–**89,** map * Aug 16–**90**

The Eng Wells, Sep 21, and Barton aqueduct, Nov 2–**88**; * May 24–**89** * Jan 31, map * July 11 * Aug 22 * Oct 10, Nov 14–**90,** Weaver river sluices * Jan 9 * Mar 6, 13 * July 17, 24 * Aug 21 * Oct 2 * Nov 6, 27–**91,** prog. * May 13 * Aug 12, 19, Sep 16 * Nov 18–**92**

MARNE & Saone, Florentin, abs. *Inst C E* v 105 –**91,** *An Trav Pub* –**91**

MERCED irrig *E News* Feb 4–**88**

MICHIGAN & Superior lakes, proposed, maps *E News* * Mar 22–**90**

NEW York, state imp. *E News* Aug 18–**92**; & Phila. ship (Del. & Raritan rivers), proposed, Haupt, inset *F Inst* * Mar –**92**

NICARAGUA ship *Eng* Menocal * Aug 22, Dec 26–**90**

E & Min maps (full) * May 4–**89**

E News surveys, June 16, ed. n 30, Menocal * July 7, 14 ed. 14, Peary, Aug 18, 18–**88,** map and inset * Sep 14, 14–**89,** proposed guarantee, ed. Feb 7, notes * May 30, * June 6, ed. 6, 13, 20, 27–**91**; engineer's report and ed. Dec 15, 15–**92**; *E Rec* May 23–**91**

F Inst and Panama, notes, Oct –**88,** Taylor, Jan, profile * Feb, Am. Isthmian routes, Ammen, Dec –**89**; Davis, inset (full) * July, Aug –**92**; Diebitsch *Lehigh Eng* Feb –**89**

Canals, NICARAGUA
Forum Miller, Merry, Feb -**92**; *R Gaz* Aug 29-**90**
Sc Am Sup (full) * Feb 2, 16, 16 * Mar 2-**89,** Peary, Jan 11, 18-**90**
The Eng Feb 17-**88,** * June 12 * July 3, Aug 14, Nov 6, 27-**91**
NORTH Sea, Amsterdam, Huet, abs. *Inst C E* v 99 -**90,** * *Tijd Konin Ing* -**88-89.** See also CANALS, Baltic
PANAMA interoceanic ship, plant and material, Williams, insets (full) *Am C E* * v 19 -**88**; Isthmus canal and our Gov't. *Atlan M* Mar -**89**
Eng Rogers Apr 20, June 8, ed. Dec 21-**88** * Jan 11, locks, inset * Nov 1-**89,** directors, ed. Nov 25-**92**
E News locks, proposed * Feb 11 * Mar 10, actual status, profiles, ed. etc. * June 2, 2, water supply 16, what the Slaven dredges are doing, Appleton, cor. 16, actual status, Snow, great Culebra cut, ed. * 16, 16, recent trip over, Lockett, 23, and Nicar., ed. July 14, prog., cor. 28; Aug 11, de Lessep's report, ed. 18; plant and machinery, Williams * 18 * 25; financial status, ed. Dec 8-**88**; cost, etc. Oct 19-**89**
E Rec Rogers (full) * Jan 28-**88**; McAlpine's opinion, Feb 22-**90**; completion, report, May 30-**91**; *The Eng;* works, Nansouty, abs. *Inst C E* v 92 -**88,** * *Genie Civil* v 12 -**88**; (cost) *R & Eng* Feb * June -**91**; new, Crowell, cor. *R Gaz* Oct 28-**92**
Sc Am Sup work on * Mar 10, locks * 31, * July 21 * 28 -**88,** * May 25, Wins (very full) * June 1, 8, 15-**89,** projects for completion, Malgarini's * Nov 12-**92**
PECOS Valley, New Mexico *E News* * Oct 17-**91**
PENN., L. Erie & Ohio river, proposed *E News* * Mar 21, do. *R Gaz* Apr 10-**91.** See also CANALS, Lakes
QUEBEC-Montreal ship channel *Sc Am* Mar 16-**89,** *Eng*
RICHMOND, Va., eng. problem at, Adams *Am M E* * v 12 -**91**
SAULT Ste. Marie, ed. *Eng* Sep 14-**88,** Sep 5-**90**; *E News* Jan 4, traffic for nine seasons, Mar 1-**90**; lock accident *R & Eng* * Oct -**90**; and Suez, traffic *R Gaz* Apr 17-**91**; *Sc Am Sup* Oct 20-**88**
SIBERIA, new waterway, abs. *Inst C E* v 92 -**88,** *Osterreich Ing* -**88**; Mas *R & Eng* Sep -**89,** *An Ponts*
SIDHNAI system, MacLean, abs. *Inst C E* v 103 -**91**
SPAIN, inland nav., abs. *Inst C E* v 104 -**91,** *An Construct* Madrid -**90**

Canals, SOUTH Yorkshire junction, proposed *The Eng* * Oct 17-**90**
SUEZ, traffic growth *E & Min* Apr 20-**89**; ships passed through *E News* Apr 28, June 9-**88**, report, July 6-**89**, traffic diagram * July 11-**91**; and Sault Ste. Marie traffic *R Gaz* Apr 17-**91**; lighting of *The Eng* * Dec 6-**89**
SUPERIOR & Mich. lakes, proposed, maps *E News* * Mar 22-**90**
WASTE weir, aut., Foote, inset *Am C E* * v 18 -**88**
Canes and sticks manuf., Jackson *Sc Am Sup* May 11-**89**; cane contrivances * Nov 26-**92**
Canning fruit *Sc Am Sup* Jan 4-**90**
Capital and labor, the rights of *Blackwood's Mag* Dec -**91**; conflicts, Howell, bk. review *Eng* Aug 29-**90**; the remuneration of, ed. Dec 11-**91**; does capital need high-priced labor, Partridge *E Mag* Aug -**92**; how to secure harmony between, Hewitt *E & Min* Oct 11-**90**, *Am Min*; the consumer, Rice *Forum* July -**92**; are business profits too large, Mann *Pop Sci* Nov -**92**. See also LABOR; MANUF. industries net profits
PROFIT-sharing, co-operation, B. Jones *Eng* Sep 19-**90**; industrialism, Esson *El Rev Lond* Nov 7, 14-**90**; gain-sharing Towne *Am M E* v 11 -**89**; profit sharing enterprises, ed. *Eng* Feb 13, ed. July 31-**91**, Gilman *Soc Arts Mass* -**89**
Carbon, bisulphide manuf. and purification, Singer (full) *Sc Am Sup* * Apr 20-**89**; funnel, for filtering, Drown *Tech Q* May -**88**; heat of combustion, Berthelot *R Gaz* July 26-**89**, *Compt r*
Carbonic acid liquid manufacture *Sc Am Sup* * June 27-**91**
Carborundum, Guy *Sc Am Sup* July 16-**92**
Carnegie, Andrew, por. *E & Min* * July 4-**91**
Carpenter, R. C., por. *Cassier's* * Jan -**92**
Carpet beating machines *Sc Am Sup* * Apr 21-**88**; industry, Phil. Apr 13-**89**; weaving, Persian, Vries, Aug 29-**91**, *J Soc Arts Lond*
Carr, Henry *Inst C E* v 95-**89**
Carr, Mark W. *Inst C E* v 93-**88**
Carriages, elastic traction, Lemoine's *Sc Am Sup* * Oct 8-**92**; torsion in, King *The Eng* * Aug 28-**91**
Carrick, John *Inst C E* v 101 -**90**
Cars and carriages, Railroad, rolling stock, Paris exhib. *Eng* Aug 30-**89**, local R's, inset * Apr 4-**90**; standards, good and bad *E News* June 9-**88**

Cars, ACCOUNTANT'S Assoc. pro. *R Gaz* June 29-**88**

AXLES, steel, Coffin *Am M E* * v 9 -**88**; effect of temp. on strength, Andrews *E News* * Feb 18, 18, 25-**88**, Nov 14-**91**, do. inset *Inst C E* * v 94 -**88**, insets * v 105 -**91**; and wheels, machine for rolling, Aitken's ap., pats. *R & Eng* * Sep -**90**; wheels and track, discuss. *R Gaz* Feb 17; 60,000-lb. cars, standard, proposed * June 8-**88**, do. Rhodes and ed. * Feb 22, 22, Mar 1, discuss. 29, M. C. B. * Oct 11; steel, tests, Pencoyd works, Nov 8-**89**

AXLE and journal-boxes, lubricating, cost, Randolph *Am M E* * v 11 -**90**; stamped steel *Eng* * June 20-**90**; Macnee's dust proof *E News* * Dec 15-**88** * May 2-**91**; bearing for 60,000-lb. cars, M. C. B. Assoc. com. report * June 14-**90**

R Gaz anti-friction metals, Bennett, Jan 18, 25; Erie journal-box * Sep 20; and bearings, Adams, Nov 22-**89**; 60,000-lb. cars, proposed M. C. B. * June 20-**90** * June 19-**91**; stamped steel * July 18; standard, proposed * Aug 22-**90**; the Timms *The Eng* Apr 13-**88**

BRAKE, Kane's *Sc Am* Feb 16-**89**. See also RAILROADS, brakes

BRUNIG, Paris exhib. *Eng* * Aug 23-**89**

BUENOS Ayres & Ensenado Port, buffet smoking *The Eng* * Feb 20-**91**

BUFFER, Westinghouse friction *R Gaz* * Nov 2 * Dec 21-**88** * Feb 21-**90**, *The Eng* * Mar 14-**90**

BUILDER'S Assoc., Master, pro. *E News* June 23-**88** * June 13, 20-**91**, June 16 * 23-**92**, reports *R & Eng* * July -**92**, table, inset (full) *R Gaz*. June 15 * 22-**88**, June 28, July 5-**89**, June 13 * 20-**90**, June 12, 19-**91**, June 17, inset * 24-**92**

CALEDONIAN R., inset *Eng* * Feb 21-**90**

CATTLE, So. R., France, wagon, Paris exhib., inset *Eng* * Nov 8-**89**; the Canda *R Gaz* * Mar 2-**88**

CHOCK, for stopping *E News* * Aug 9-**90**

CLEARANCE in width required by *R Gaz* * Nov 9-**88**

COAL, Chic. Rock Is. & Pac. standard, inset *E News* * Aug 11 -**92**; Tex. & Pac. *R & Eng* * Nov -**91**; standard * Apr * May -**92**

COUPLERS, standard, dimens. *E News* * Jan 28-**88**; contour lines, etc., Barnes * Jan 3-**91**; breakages, service record and ed. * Feb 15, 15-**90** * May 12-**92**; and brake legislation *R & Eng* Mar, May -**92**; vertical plane, in service, ed. *R Gaz* Jan 17; frt., C. B. & Q., broken * June 6-**90**; vertical plane,

Car COUPLERS
Barnes, and aut. air brakes * Jan 2, Feb 6, ed. 6; what constitutes a defect in ver. plane, discuss. 23, mixed unlocking gear disadvantages * Nov 13-**91**; strength, Forsyth, Mar 4, 11 -**92**
BLACKSTONE'S platform and *R Gaz* * July 15-**92**
BUHOUP'S *E News* * August 25-**92**
CHICAGO, the *R Gaz* * Nov 14-**90**
DREXEL *R Gaz* * May 15-**91**
EMPIRE *R & Eng* * June -**92**
FOX aut. vertical plane *R Gaz* * June 20-**90**
HINSON *E News* * Aug 1-**91**
HUSELTON aut. *R Gaz* * Apr 11-**90**
JANNEY frt., safety stop for *E News* * Jan 2-**92**; *R Gaz* * Feb 17-**88**, vs. Miller, ed. Apr 11, evolution of * June 6, life of, diagrams of broken * Nov 7-**90**, with Bentley's vestibule * May 1 -**91** failures * May 13-**92**
KEYSTONE *E News* * Nov 2, *R Gaz* * Nov 8-**89**
MASTER Car Builder's aut. *E News* introduction of, ed. Mar 28, R's equipped with, inset map * Apr 25, 25 * June 13, standard gauges for * Sep 19-**91**, strength, Forsyth * Mar 5-**92**
R & Eng form of contour lines, report * May -**88**, standard gauges * Oct -**91**, possibilities of, discuss., Eastwick (full) * Apr, May -**92**
R Gaz * Apr 20-**88**, at interchange points, ed. * July 25 * Aug 18, on curves * Oct 3-**90**, broken knuckles * Jan 2, cost, ed. May 15, report * June 12, standard gauge * Sep 18-**91**, M. C. B. Assoc. action, Apr 22, testing machine * Sep 2-**92**
ROBERT-Eastwick *R Gaz* * June 6-**90**
TESTING, method *R Gaz* * Aug 19, testing machine * Sep 2-**92**
THURMOND frt. *R Gaz* * June 5-**91**
TROJAN *E News* * Nov 29, *R Gaz* * Dec 5-**90**
UNION aut. *R Gaz* * Jan 30-**91**
VAN Dorston and buffer *R Gaz* * Dec 14-**88**
DERRICK, 15-ton, Penn. *R Gaz* * Oct 18-**89**, 10-ton, Balt. & O. * Jan 9-**91**
DRAW-bars, height of M. C. B. com. report *E News* June 28-**90**; Graham's draft rigging, Penn. R., discuss. *R Gaz* * Mar 29, 29; Cushing's stop * Oct 25; Chic & N. W. * Nov 1-**89**; Safford aut. * Oct 17-**90**; Butler draft gear * Apr 1; draft gears for frt. cars, Barnes * June 3-**92**

Cars, DUMP, Can. Pac. *E News* * July 21-**88**; rotating * July 12 -**90**; iron, No. R. of France *R & Eng* * July -**88**; the Goodwin * July -**89**; Thacher compressed air * Dec -**92**, do. *R Gas* * Nov 11-**92**; George's Creek & Cumb. * Jan 25-**89**; and gondolas, Goodwin, Jan 31; standard, B. & A. * Mar 7-**90**

FRANCE, experimental, West. R., Paris exhib. *Eng* * Oct 4; local R's 2d class, Paris exhib. * Nov 29; 1st class, So. R, inset * Dec 13-**89**; State R * July 4-**90**; pass. *R Gas* * May 15 -**91**. See also CARS, dump—freight

FREIGHT, Goodfellow & Cushman's *Eng* * Dec 7-**88**; unloading by steam shovel *E News* * Oct 5-**89**; construction imp., Barnes * Jan 30; lubrication, cost, Dec 1-**92**

R Gas relative cost of car load and less, Fink, Feb 3; depreciated values, table, Apr 27; ballast and plow, Roger's * July 27-**88**; equity of per diem and mileage plan, Yardley, Wattson, cor. Mar 15, Apr 5; relative econ. of large and small capac., ed. Apr 26; springs, bolster, tests, Hazlehurst, diags. * Oct 4-**89**; end platforms for, ed. Jan 10: housing for gondolas and stock * Mar 28; ventil., Pancoast's system * Apr 11; mileage decrease on home roads, Wattson, July 11; handling and distrib. on West Shore Oct 10-**90**; Harvey steel box * June 5-**91**; construction and design, Barnes * Jan 29, Lamont's steel * Feb 5-**92**

BALT. & O. 50,000-lb. box, details *R Gas* * Mar 27-**91**, iron box *R & Eng* * Dec -**92**

BELGIUM, Grand Cen. R. wagon, Paris exhib. *Eng* * Oct 11-**89**

BUFFALO, Roch. & Pitts. 60,000-lb. box and truck *R Gas* * Dec 19-**90**

CHESAPEAKE & O., combination *R Gas* * Feb 1-**89**; stone * Sep 23-**92**

CHICAGO, Bur. & Q. standard *R Gas* * June 21-**89**; & N. W. standard, 50,000-lb., box (full) * Jan 10-**90**; Rock I. & Pac. coal, standard, inset *E News* * Aug 11-**92**

DENVER & Rio Grande box, standard gauge *R Gas* * Oct 9-**91**

FRANCE, So. R. cattle wagon, Paris exhib., inset *Eng* * Nov 8, platform wagon, do. * Dec 20-**89**

GERMAN composite *R Gas* * Dec 27-**89**

HOELLENTHAL R., inset *Eng* * Mar 13-**91**

INTERCHANGE rules *R Gas* May 24-**89**, com. report, May 22 -**91**

LAKE Shore, 30-ft. standard *R Gas* * Dec 30-**92**

Cars, Freight, LEHIGH Valley, 50,000-lb. standard *R Gaz* * June 8; twin hopper bottom gondola, 60,000-lbs. * Sep 14–**88**; 50-ton capac. platform car * Aug 16–**89**

NEW York, L. Erie & W. side-dump, 80,000-lbs. capac. *E News* * Apr 19, 19–**90**

NEWPORT News & Miss. Valley gondola *R Gaz* * Apr 6–**88**

NORTHERN Pac. hopper side chute *R Gaz* * Apr 5–**89**

PENN. 100,000-lb. *R Gaz* * May 11–**88**; 40-ton side-dumping gondola * Mar 15–**89**

SPAIN, 13-ton iron ore wagon, Parcocha R., inset *Eng* * July 17–**91**

TUBE-frame, Jefferds *Eng* Nov 7 * 28–**90**, do. goods wagons, insets (full) *Inst M E* * Oct –**90**, do. cor. *R Gaz* June 5–**91**, do. and effect on expenses of R's *The Eng* * Nov 14–**90**

GATES, the Gold platform (N.Y. eleva. R.) *R Gaz* * Nov 30–**88**; B. & A. * Mar 21–**90**

GREAT So. & W. of Ireland, composite *Eng* * Oct 19–**88**

GREAT Western, England, corridor cars *E News* Mar 26 * Apr 28, *The Eng* * Apr 15–**92**

HEATING, Bache's heater, com. report *F Inst* * Aug –**88**; Leland hot water heater *R Gaz* * Sep 11–**91**; hot water continuous, Safety Co. * Sep 6–**89**

STEAM, notes on, Baldwin, a safety system, Towne *Am M E* * v 9 –**88**; safe train system, Gibbs' car *El Wld* * June 21 –**90**; appliances *Eng* * Mar 4–**92**; Waitt *E & Min* * Oct 1–**92**

E News steam from the locomotive, com. report, June 30; Baldwin * Aug 18–**88**; non-pressure system * May 18–**89**; by direct steam, June 7 * Nov 22: prog. of steam heating, inset map and ed. (full) * June 7, 7; Consol. Car-heating Co. systems * Sep 6, do. aut. temp. regulator, 20–**90**; diagram * May 16–**91**; standard couplings * June 16; Waitt, Sep 29 –**92**; P. Atkinson *Lehigh Eng J* June –**89**

R Gaz aut. control of heat, Temple, Apr 13; expts., discuss. 20 * May 18; Stand. Car Htg & Ventil. Co. continuous system * June 15; M. C. B. expts., report, inset table and ed. 22–**88**; essential elements of, W. Johnson, Feb 1; continuous, cir. replies, Mar 22, Apr 12–**89**; Consol. Car H. Co. couplings * May 2; econ. of, Sewell, Nov 7–**90**; Halladay, Sep 23, Waitt, 30–**92**; econ. of, Sewall *Sc Am Sup* Nov 29 –**90**; Lanza * *Soc Arts Mass* –**89**, *Tech Q* * Oct –**88**; and couplers *The Eng* Jan 27–**88**

Cars, Heating, Steam, CALEDONIAN R., exhaust steam ap., Drummond *Inst C E* * v 92 -**88,** *The Eng* * Jan 4, 4-**89**
CHICAGO, Mil. & St. P. contin. *R Gaz* * Jan 13-**88,** light and heat tender (full) * June 13-**90**
ERIE system *R Gaz* * Feb 3-**88**
GIBBS' safe train system *El Wld* * June 21-**90,** steam hose coupler *E News* * Dec 5-**91**
GOLD continuous system, Lehigh Valley *R Gaz* * Mar 9; storage, test, May 11-**88**; * Aug 30-**89**; coupling and joints * Mar 21; * June 6; coil and Baker stove * Dec 26-**90**
MARTIN coupling *R Gaz* July 18-**90**
MCELROY system, test *R Gaz* Apr 6-**88**
NORTH Western system, coupling and trap *E News* * Mar 30 -**89**; *R Gaz* * Jan 27-**88**
PENN. R., Ely *E News* * Nov 15, *F Inst* * Nov *R & Eng* * Dec -**90**; Williams' system, expt. *R Gaz* Feb 24-**88**; continuous * Mar 22-**89**
ROBERTS' system, *R Gaz* * Apr 17-**91**
SEWALL contin. system, hose coupler *E News* * Nov 21-**91**; *R Gaz* * Jan 20-**88**
WILLIAMS' system, Penn. R., expt. *R Gaz* Feb 24-**88**
INDIAN State carriages, Rajah *The Eng* * Nov 4-**92**
INSPECTION, Susque. Coal Co. *E News* * Aug 17; Penn. R. * 31-**89**; the Ionia *R Gaz* * Apr 26-**89**; joint insp., com. report, June 19-**91**; saloon, So. E. R. *The Eng* * Aug 14, 21-**91**
INTERCHANGE rules, M. C. B. report *R Gaz* Apr 8-**92**
IRON and steel, construction, steel plate and malleable iron in, M. C. B. report *E News* * June 14-**90**; steel stock car, inset * July 11-**91**; iron con., pros and cons, ed. May 19-**92**; iron dump frt., No. R., France *R & Eng* * July -**88**; iron box, B. & O. * Dec -**92**; iron construction, Ettenger *R Gaz* Nov 30 -**88**; Am. steel fire-proof postal * Jan 4-**89**; Schoen pressed steel, inset * May 23-**90**; steel in car construction, Mar 27; Harvey steel box frt. * June 5; pressed steel and malleable iron con., com. report * 12-**91**; construction and design, Barnes * Jan 29; Lamont's steel * Feb 5; Harvey steel construction * 26; iron and steel box, Mex. R. * Aug 5-**92.** See also CARS, tube-frame
LAKE Shore & Mich. So. standard pass. *R Gaz* * Sep 16-**92**
LIGHTING, electric, Leonard *El Eng* July 9-**90,** Bauer, June 8-**92,** Timmis *El Rev Lond* * Sep 11-**91,** do. *El Rev* Jan 11-

Cars, LIGHTING

92, with storage (secondary) batteries, A. Brown *El Wld* * June 1-**89,** Bauer, June 11, Silvey storage battery system * Dec 31-**92,** Sartiaux *Eng* * Oct 25-**89**

E News, systems, cost, ed. and cor. May 25; with storage (secondary) batteries, A. Brown, July 6-**89**; electric, Penn. R., inset * Aug 23, do. Sartiaux, Nov 1-**90**; modern methods and ed. Mar 7, 7, 14, comparative merits, various systems * Apr 18, 25 * May 2-30 * Aug 15, 22, the Pintsch compressed gas system * 29 * Sep 5, 19, 26, oil lamps * Oct 10, 17, electric * Nov 14, 21 * Dec 5, 19-**91,** Mar 12-26, Apr 2, 9, and ed., 16, 16, Bauer, June 9-**92**

Inst C E electric, Sartiaux, abs. v 101 -**90**; Langdon, discuss., inset * v 106 -**91**; *An Telegr* v 17 -**90**

R Gaz electric, Timmis * May 18-**88,** ed., Feb 8, Waite, Mar 1, Frost dry carburetter system, Penn. R. * June 7, elec. light car, Cumb. Val. * 21, elec., Selden, Oct 25, elec. in Am. and Europe, Sartiaux, Nov 29-**89,** by power from the axles, arr., Lond., Brighton & So, Coast R. * Jan 3, Gibbs, * Feb 7, light and heat tender, Chic. Mil. & St. P. (full) * June 13, elec., Leonard, July 11; Frost carburetter tests * 18-**90**; Gibbs elec. (full) Mar 6, (cost, various systems) cor. Aug 28-**91**

LONDON & S. W. works, Eastleigh, England, *Eng* * July 29; bogie composite * Aug 5-**92**

LUBRICATION, Hall *E News* * June 27-**91**; lubricants, English, and testing *R Gaz* * Feb 14-**90**

MEXICAN R. iron and steel box *R Gaz* * Aug 5-**92**

PAINTING, Master Car & Locom. Painter's Assoc. pro. *R Gaz* Sep 20-**89,** Sep 19-**90,** Oct 2-**91**; M'Keon *Sc Am Sup* Oct 1-**92**

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Cements
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Chemical

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MANGANESE precip. as ammonium mangan. phosphate, McKenna *Tech Q* Nov -**90**
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Cincinnati, Ohio *Eng* * Aug 8-**90**
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E Rec town refuse destruction, Codrington, report * Sep 15, 22, Oct 13, 20, Dec 22-**88**; European, growth, n Feb 21-**91**; steam heating of, Emery *F Inst* Mar -**88**; pass. traffic in great, Croes *R Gaz* * Dec 16, 30-**92**; growth of pop. in *Sc Am* Mar 30-**89**; refuse and garbage disposal, Foster *Sc Am Sup* * Jan 23-**92,** *Eng*; European, pass. transportation in, consul. rep. *St R J* Feb, May -**92.** See also MUNICIPAL eng; PAVEMENTS; SEWERAGE; STREETS; WATER-works, etc.

City engineers. See ENGINEERS, city
Civil engineering. See ENGINEERING, Civil.
Clarke, Henry W. *Am C E* v 26-**92**
Clarke, W. A., (mining) por. *E & Min* * June 20-**91**
Clausius, Rudolf J. E. (full) *Inst C E* v 96-**89,** *Sc Am Sup* Feb 9-**89**
Clays, varieties and qualities for puddle, Gallon *E News* Dec 1-**88,** do. abs. *Inst C E* v 94-**88**; constitution of, Chatelier v 91 -**88,** *Genie Civil* v 11-**87**; clay pipe manuf. *Sc Am Sup* * July 20-**89**; Tallow, Seamon, Sep 27-**90**; kaolin, Blandford, Mass., Crosby *Tech Q* Aug -**90,** do. Ashland, Mass., Hollis, Apr -**92.** See also FIRE-clays
Clayton, James, por. *E & Min* * July 30-**92**
Clayton, Nathaniel *Eng* Jan 2-**91**
Clegram, William B. *Inst C E* v 98-**89**
Cleveland, O., st. traffic tonnage, Torrey *E News* July 28-**88**; st. R's and industries *St R J* sup. * Oct -**92.** See also MUNIC. eng; PAVEMENTS; SEWERAGE; STREETS; WATER-works, etc.

Climatology. See RAINFALL

Clocks, elec., the Hammer *El Eng* * Aug 17-**92**; elec., Mayrhofer's time system *El Rev* * July 5-**90**; for equat. telesc., Lick observ. *Eng* * Aug 17-**88**; Conant's isochronal, Paris exhib. * Sep 6-**89**; iron clock tower construction *E Rec* * Dec 6-**90**; first chronometer *Locom* Apr -**90**. See also TIME, standard; WATCHMAN'S clock

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Cloth pressing machine, Nussey's *Eng* * Mar 6-**91**

Clutches, hydr., Barney *El Rev* * May 7-**92**; Brown's friction coupling *El Wld* * Jan 12-**89**; Snyer's pulley *The Eng* Jan 6; friction, Adams, Sep 7, Pardoe, cor. 21, cor. Oct 5-**88**, do. Edmeston's * Feb 8; spring friction, Megy, Aug 30-**89**

Coal, trade, U. S. and miners' wages, 1888, Ashburner *Am Min* v 18-**90**; and coke, do., U. S. production, stats. 1887 *E & Min* June 16-**88**; stocks, prices, 1888, Jan 12; U. S. produc. 1888, Ashburner, Mar 16-**89**; testing value of different, Kent, July 19-**90**, effic. (full) Oct 10-31-**91**; trade, 1889-90, Jan 3; industry, cen. bull. Feb 21; produc. west of Miss. river, J. Jones, Apr 4-**91**; effic. det. of, Bunte, Sep 24-**92**; world's production of, Swank *E News* Feb 8-**90**; calorific value of, Dentecom, abs. *Inst C E* v 108-**92**, *Zeit deut Ing.* -**91**, culm *Pwr* Sep -**90**; supply *R & Eng* May -**89**; business of Northwest *R Gaz* Nov 18-**92**; how to analyze *The Eng* Apr 20-**88**; and gas trade of London, ed. Sep 20; duration of English supply, Hall, Nov 15-**89**; and labor, tables and ed. May 6, 16-**92**

ALABAMA, coal-fields, development and stats. of, Ashburner *Am Min* v 17-**89**; and iron industries, 1888, Phillips *E & Min* Jan 12-**89**, review do. Jan 3; coal-fields of, McCallen *Sc Am Sup* Jan 10-**91**. See also under COAL mines

AM. cannel, notes on, Macfarlane *Am Min* v 18-**90**

ANTHRACITE, small sizes, prep. and util. of, discuss. *Am Min* v 20-**92**; wt. cu. ft. broken to market sizes, table *E & Min* June 1-**89**; market review, 1891, Jan 2-**92**

PENN., Bernice basin, Sullivan Cty., notes, Claghorn *Am Min* * v 17-**89**; produc., J. Jones report, abs. *E & Min* Jan 17-**91**; field of Pa., Wasmuth *F Inst* Feb -**88**, stratification, inset * Nov -**92**; mine law, Pa. *E & Min* June 13-**91**;

MINING, new method, proposed, Gresley * Aug 17-**89**, importance of tunnels and cross-cuts in, Wasmuth *F Inst* Feb -**88**

Coal, Anthracite, WASTE, util. by gasification in producers, Blauvelt *Am Min* v 20-**92**; Sheafer, cor. *E & Min* Sep 22, Nov 3-**88**; and exhaustion of supply *Sc Am* Oct 6-**88**

BELGIUM indus., 1891, Walleyne *E & Min* Jan 2; produc., Harze, abs. *Inst C E* v 108 -**92**. See also under COAL mines

BITUMINOUS, pyrite in, Brown *Am Min* v 16-**88**; mining, electricity in, Sperry *El Eng* * July 6, (full) *El Rev* * July 23. (full) *El Wld* * June 25-**92**; in Pa., J. Jones *E & Min* June 13-**91**; market review, 1891, Jan 2-**92**

BREAKER, Drifton iron and machin., Coxe, insets (very full) *Am Min* * v 19-**91**; separating and washing plant, Merry colls., inset *Eng* * Feb 13-**91**; plant at Carmaux, France *E & Min* * Sep 6-**90**; separating and washing plant at Zollern, Dortmund, Ger. * July 2-**92**

BRIQUETTE making in France *E & Min* Aug 2-**90**

CANADA, Western, notes, Merritt *Am Min* v 18-**90**

CHINA, North. See under COAL mines

CHOCTAW coal-field, geol. of, Chance, insets *Am Min* * v 18-**90**, *E & Min* * Dec 7-**89**

CHUTE, Burnett & Clifton aut., inset *E News* * Dec 26-**91**

CLEANING, ed. *Eng* July 18-**90**. See also COAL washing

COLORADO, Northwestern region, Hewett *Am Min* v 17-**89**; Col. Coal & Iron Co. report *E & Min* April 4-**91**

CONVEYORS, *Cassier's* * Apr -**92**

CUTTING, elec. mining machines in Ohio, Haseltine *El Wld* * Nov 28 * Dec 5, 5-**91**

DRIFTING machine, Stanley's *E & Min* * Sep 7-**89**

FRANCE and Germany production, cost *E & Min* May 18-**89**

GERMANY, lignite deposits and indus. *Eng* * Mar 22; and France, produc., cost *E & Min* May 18-**89**; indus. Jan 31; iron and steel produc., Ger. Empire, 31-**91**

ILLINOIS, fossil fuels of Comstock *E & Min* July 9-**87**, cor. May 25-**89**

ILLINOIS, Ind., Mich. and Ohio products, '89, J. Jones *E & Min* June 27-**91**

KANSAS and Missouri, thin seams in, Winslow *E & Min* * Feb 13-**92**

KENTUCKY, Western, coals and cokes, J. H. Allen *Am Min* v 16 **88**; product, J. Jones, cen. bull. *E & Min* Aug 8-**91**

MICHIGAN, Ill., Ind. and Ohio products, '89, J. Jones *E & Min* June 27-**91**; New Buffalo coal. station *E News* * Nov 10-**92**

Coal, MINES and mining, the Kaiping mine, North China, Kwang, Silliman, photographing interior of a, Dewey, insets *Am Min* * v 16, 16-**88**; Pratt mines, Tenn. C. & Iron Co., Ramsay, insets, notes on mining in Oregon, Norton * v 19, 19-**91**; elec. mining ap.. the Jeffrey *El Eng* * Dec 10-**90**, electricity in bitum. mining, Sperry * July 6, do. (full) *El Rev* * July 23, do (full) *El Wld* * June 25-**92**; elec. applics., Richart * Nov 28 * Dec 5, 5-**91**; Belgium mining *Eng* Dec 12; miners past and present, ed. 19; mining in New So. Wales, 26-**90**; and iron ore mining, U. S., ed. Nov 27-**91**; perils of mining, Norwood *E Mag* * Nov -**91**

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Inst C E Walcher mining ap., Grey, abs. v 92 -**88**, *Bull Soc Min* v 1 -**87**; 3280 ft. deep, near Charleroi, Lemay *Inst C E* v 94, *Genie Civil* v 12 -**88**; Houssu mine, Belgium, shaft sinking by Poetsch freezing proc. *Inst C E* v 96 -**89**, * *Bull Soc Min* v 2 -**88**; North China mines, Kinder *Inst C E* * v 103-**91**; mechan. eng. of mines, Bainbridge, insets *Inst M E* * July -**90**; Ala. mines *Sc Am Sup* Sep 29-**88**; high explosives in mines, ed. *The Eng* Sep 12-**90**; Cadeby mine pumping appliances, Chambers * Oct 21-**92**

MISSOURI and Kansas, thin seams in, Winslow *E & Min* * Feb 13-**92**

MONTANA coal-fields, Weed *E & Min* * May 14, 21-**92**

NEW South Wales, mining in *Eng* Dec 26-**90**

NOVA Scotia mining, ed. *E News* Dec 15-**88**

OREGON, notes on mining in, Norton *Am Min* v 19-**91**

PENN., Cambria C. & Iron ore mines, Johnstown, map *E & Min* * June 8-**89**

PIER, iron, Norfolk & West. R., Va., Coe, discuss., insets *Am C E* * v 27 -**92**

SCREENING and washing, Commentry, France *E & Min* * July 27, *Genie Civil;* gyrating screen, Coxe & Salmon *E & Min* * Sep 21-**89**

Coal, SEAMS formation, Gresley *E & Min* * Feb 25-**88**
SHED roof, Burlington, Vt. *E News* * Mar 14-**91**
SOUTHERN coal-fields, review, Phillips *E & Min* Jan 4, 4-**90**
STEAMERS, Australian and eastern mail, Robertson, cor. *The Eng* Nov 2-**88**
STOCKING and reloading, new method, Dodge *Am M E* * v 9, do. *Sc Am Sup* * Mar 3-**88,** *Am Eng;* storing, mod. methods, Milnor *Cassier's* * July -**92** ; trestle, Buffalo, Lehigh Val. R. *R Gaz* * Aug 8-**90**
STONE, in lead blast furnace, Neill *E & Min* July 25, Dwight, Aug 8-**91,** *Am Min*
SURVEYS in Westphalia, cost of, Werneke, abs. *Inst C E* v 92 -**88,** *Mitt Mark* -**88**
TENN. C. Iron & R. Co. Pratt mines, Ramsay, insets *Am Min* * v 19 -**91** ; product, J. Jones, cen. bull. *E & Min* Aug 8-**91**
TEXAS coal-fields, Wertzel *E & Min* Aug 23-**90**
TIPPLE at Dunlow, W. Va., Low *E News* * Nov 3-**92**
TRANSFER, Mt. Carbon Co., Page, inset *Am Min* * v 17 -**89**
UTAH produc., '86, Ashburner *Am Min* v 16-**88**
VIRGINIA, So. West coal-field, Killebrew *E & Min* Jan 19-**89** ; West Va. product, etc., J. Jones, cen. bull. Aug 8-**91**
WASHING plant, Merry colls., inset *Eng* * Feb 13-**91** ; at Zollern, near Dortmund, Ger. Jan 29, and sep. plant * July 2-**92**
WASHINGTON State, measures of, Densnap *E & Min* Aug 29-**91** ; coal-fields, Wood *R & Eng* May -**90**
WASTE Commission, Pa. *F Inst* Oct -**90** ; and remedies *R Gaz* Mar 15-**89**
Coast defence, ed. *Eng* Mar 2-**88,** railroads for, ed. May 15; Fiske's elec. position finder * Nov 27-**91** ; tactics of, Walford *The Eng* Jan 31-**90** ; and harbor, dual nature of *J Mil Ser Inst* May -**92.** See also MILITARY eng.
Coastguard boats for Roumanian Gov't. *The Eng* Nov 2, 2-**88**
Cochrane, John *Inst C E* v 109 -**92**
Coddington, John G. T. *Inst C E* v 104 -**91**
Coghlan, John *Inst C E* v 103 -**91**
Cogswell, William B., por. *E & Min* * Oct 24-**91**
Cohen, Mendes, por. *E News* * June 9-**92**
Coils, metal, friction of, H. Shaw *Sc Am Sup* * Nov 10-**88.** See also SPRINGS
Coins, foreign, values *E & Min* Jan 4-**90,** Jan 10-**91,** *E News* Feb 16, 23-**89.** See also MINT reports

Coke, Richard G. *Inst C E* v 96 -**89**

Cokes, and coals, Western Kentucky, J. H. Allen *Am Min* v 16-**88**; the Bauer ovens *Eng* * June 20-**90**, *The Eng* Jan 20-**88**, *E & Min* * July 19, the Semet-Solvay * Aug 9-**90**; produc. in Pocahontas field, Va., Weeks, Sep 10; Hoffman-Otto oven * Nov 5-**92**; indus., util. of bye-products, Terne *F Inst* * Nov -**91**; manuf. in Connellsville dist., Pa., Siebert *Lehigh Eng J* June -**88**

Cold, and mortality, Richardson *Sc Am Sup* Nov 21-**91**; storage, Velly's, Paris * Aug 30-**90**. See also ICE — REFRIGERATING machines

College graduates, Munroe *Tech Q* Feb -**89**

Colors, a standard of *Eng* * May 29-**91**; spectra of various orders of, Croft, Dec 16-**92**; origin of, Armstrong *Sc Am Sup* May 19-**88**; analysis method, Lovibond * June 7, sensation, Abney * 14; and coloring, Church (full) Sep 6-20-**90**, *J Soc Arts Lond*; photometry, Abney *Sc Am Sup* Feb 27, Mar 5; Lovibond's tintometer, Edridge-Green * 12; sense of color, Rutherford (full) Oct 22, Morton * 29-**92**. See also LIGHT; MINERALS, colors

Colorado, Aspen mt. geol. and mines of, Henach (full) *Am Min* * v 17 -**89**, do. mining district geol., Newberry, v 18 -**90**, do. ore deposits geol., Siver *E & Min* * Mar 17, 24-**88**; Boulder Cty. interesting vein, phenom. Farish *Am Min* * v 19 -**91**; lake in Col. desert *E News* Oct 3-**91**; iron resources of, Chauvenet *Am Min* v 18; Leadville, Iron Hill, geol. and ore-deposits, Blow, insets * v 18-**90**; Red mt. mining dist. bedded ore deposits, Kedzie * v 16 -**88**, hot spring formations in, criticism on Emmons, Comstock v 17 -**89**, do. Ouray Cty. ore deposits, Schwarz v 18 -**90**

Columbia Republic, So. Am., notes on, Randolph *Am Min* v 18 -**90**

Columbus, Christopher, Dunlop *Arena* Oct; monument *Sc Am Sup* * Oct 15-**92**

Columbian exhibition, World's. See EXHIBITIONS, U. S. Columbian

Columns, *Am C E* iron, expts., Strobel, insets * v 18 -**88**, do. *E Rec* Dec 3-**87**; Bess. steel bridge compression members, expts. on strength of, Dagron, insets *Am C E* * v 20 -**89**; strength, new formula, Du Bois, discuss., inset * v 27 -**92**

E News strength, formulas, Johnson, Dec 22-**88**; high un-

Columns
braced wrt. iron, Edison station, N. Y. city * May 30-**91**; sections, cor. * Jan 9; for heavy buildings, Deforth * 30; the Larimer steel * July 28-**92**; yellow pine posts, new formula, proposed, Stanwood *Tech Q* Apr -**92**

Combustion, notes on, Chomienne *R & Eng* Aug — Dec -**91**, Jan, Feb -**92**; of hydrogen and atomic wt. of oxygen, Keiser *Sc Am Sup* * Aug 18-**88**. See also FUEL; FURNACES

Commerce, internat. growth and Chic. exhib., ed. *Eng* Nov 4-**92**; commercial points of world, distance between, table *Lehigh Eng J* Feb -**89**; evolution of, Hubbard *Sc Am Sup* May 21-**92**

Companies, corporate organization, Hall *El Eng* Sep 17, Oct 22; *El Rev* Sep 20-**90**; English joint stock, formation of *E & Min* Aug 17-**89**; promoters, trustee, obligations of (mining), Dunderberg case, Nov 1-**90**; public and state treatment of corporations, *Scribner's*

Compass, French pocket-compass, Bergier *Am Min* * v 18 -**90**, *E & Min* * Sep 14-**89**; hist., theoret. and practical, Wilson-Barker *Sc Am Sup* June 18-**92**

Composing machinery. See TYPE setting and composing machines

Compressed air. See AIR, compressed; STREET railroads, compressed air mo. power

Comptograph, Felt's *Eng* * Dec 25-**91**

Concentrators, multiple 'effet,' Hudson *Sc Am Sup* * Aug 9-**90**, *The Eng*

Conclusions, the uncertainty of, Mendenhall *Sc Am Sup* Aug 6 -**92**, *Science*

Concrete, beton, tensile strength, tests *E News* May 17; Carlin's mixer * July 5-**90**; notes on, Newman, bk., Spon, Lond. and N. Y., 1887 *The Eng* July 13-**88**. See also CEMENTS, mortars and concretes

Condensers, surface, Whitham *Am M E* v 9 -**88**; vapor, aut. reg. of injection water, McBride * v 12 -**91**; independent condenser, Conover *Cassier's* * June; and surface do. in Germany, Heinrich *Pwr* * Aug, and feed water heaters, do. * Oct; condensing water, continuous use * Dec -**92**; condensing water extraction ap. *Sc Am Sup* * Aug 18-**88**. See also ENGINES, compound condensing; MARINE engines

Conder, Francis R. *Inst C E* v 100 -**90**

Conduit scrubbing machine, Boston water-works *E News* * June 9-**92**

Conicograph (instrument), R. Harris *Sc Am Sup* * Mar 8-**90**

Conic sections, MacCord *Sc Am Sup* * May 23-**91**, do., Roberval's method of drawing tangents * Nov 5-**92**

Connecting rods and couplers, force of inertia, Klein *F Inst* * Sep * Oct -**91**. See also ENGINES — LOCOMOTIVES, conn. rods

Connor, Augustus S. W. *Inst C E* v 95 -**89**

Conquest, Alexander W *Inst C E* v 110 -**92**

Consular and diplomatic reports, various countries, *The Eng* files -**88**-**92**

Consumption (disease), Mays *Sc Am Sup* Apr 7-**88**

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Conveyor, antifriction spiral *The Eng* * May 3-**89**

Coode, John *Am M E* v 13 -**92**, *Eng* Mar 4-**92**

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Cookery for workingmen's wives, Underwood, report (full) *Sc Am Sup* Jan 4-25-**90**

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El Eng produc. and price, Wells, Dec -**89**; electrolytic refining, Gore, Nov 19-**90**; extraction, Hoepfuer's electrolytic proc. Dec 2-**91**; electrol. refining, Badt, June 15-**92**

El Rev Lond voltameter, Anderson * Oct 19; contracts, Nov 2-**88**; Elmore's Co. May 24, June 14-**89**; annealing, Cummins, Sep 5; electro-dep., Fitz Gerald, Dec 5-**90**; Elmore's French electro-dep. Co. Jan 16, ed. 30, 30, Feb 6, Apr 17, 24-**91**, report, Jan 1, 1, report, Apr 22, 29; tempered, Oct 28; Elmore Co's, report, Dec 30, 30-**92**

El Rev tempered, tests, Eureka Co. Dec 27-**90**; electrolytic refining, Badt (full) July 9-**92**

El Wld sulphate, electrolysis in standardizing elec. instruments, Meikle * May 5-**88**; electrolytic refining, Gore, Nov 22-**90**; U. S. produc. Jan 17-**91**; electrolytic refining, notes, Badt (full) June 25; electro-metallurgy of, Cazin * Sep 10, 17-**92**

Copper

Eng extraction proc. June 22; smelting, Am. methods, Westmoreland, cor. Aug 10; Elmore depositing proc., ed. Nov 23-**88**; syndicate, Paris, ed. Mar 15-**89**; Calumet & Hecla mines and Tamarack, Aug 29; L. Superior mines * Nov 7-**90**; smelting, basic linings in, Jan 16; Elmore's depositing proc. 30 -**91**; region of Mich., Phelps, insets *E Mag* * Oct -**92**

E & Min Quincy and Osceola mining Co. report, Mar 31; Tamarack mine, Mich., report (full) * Sep 15; crisis, Lawson, pph. review, 15; Cal. & Hecla, profits of a great mine, 15; copnickel, Sudbury mines, Peters, 22; syndicate contract, Nov 3, 24; United and Champion mines, New Zeal., Henrich * 17; Hampe's method of det. Cu_2O, Dewey, Dec 1, correction, 8; Elmore electro-deposition for wire bars, 8-**88**, tube making proc. May 1-**86**, Aug 18-**88**, Aug 20-**90** * Mar 21, 21, Watt, cor. Apr 18-**91**; U. S. produc. '87 (full) Jan 7-**88**, review (full) Jan 12, Feb 16, Apr 7, 21, July 28; '88, Lewis report, Feb 2; Atlan. mines reports, Mar 23, corner, 23; Quincy mining Co. report, Apr 13, Santa Fé, San Pedro mines, N. M., Raunheim * 13; Ariz. indus., Trippel, May 11; es. of by potassic cyanide, Brugman, 18; corner, relation between Comptoir D'Escompte and Soc. des Metaux, 25; Rio Tinto Co. report, 25, stats. July 13; electrolytic det. by storage bat., Ferguson * Aug 24; Tamarack mining Co., Mich., report * Sep 28-**89**

E & Min indus. and market, '89 (full) Jan 4, 4; U. S., Lond. mines produc. and consumption, 25; Quincy mining Co. report, Mar 1; Coxheath mines, Cape Breton, N. S. * Apr 19; annealing, Cummins, Aug 23; mining district of Mich. and its industries (Cal. & Hec., etc.) * Sep 27: indus. of Houghton Cty, Oct 4; Tamarack mining Co. report, 11, cor. 25; matte smelting, discuss., Lang, Aug 2, Nov 15; Boston & Mont. Consol. Cop. & Sil. mining Co. report, Nov 29; cupriferous pyrites treatment at Huelva, Spain, Launay, Dec 27-**90**, *An Mines* v 16

E & Min produc. '90 (full) Jan 3, '89, Kirchoff, Oct 3; Atlan. mining Co. report, Mar 21; Allouez mining Co. report, 28; produc. '90 and supplies of world, Apr 18; Elmore dep. proc., Peck, cor. June 20; matte smelting in reverb. furnaces, Bettel, July 18, *Chem News* June 26; matte, Manlies' converter for, May 23 * Sep 12; Coxheath mines, Cape Breton, N. S. Oct 10; smelting, mod. Am. methods, Peters, bk. review, Dec 5, do. lit. of, Lang, 26-**91**

Copper

E & Min market '91, stats. (full) Jan 2; smelting reverb. furnaces, es. of labor and material on, Peters * 16; cop. mining profits, ed. 23; cost of producing, ed. Feb 6; extraction, Siemen's electrolytic proc. * Mar 19; and spelter, world's produc. 19; Hoepfuer's electrolytic proc., Eilers * Apr 30; trade understanding, stats., ed. July 23; Asbio mines. Japan, Menzies, Aug 6; electrolytic refining, notes, Badt, 6; and silver, Boston & Mont. report, abs. Nov 19-**92**

E News production of world, 1879-'88, Feb 2-**89**; manuf. by electro-dep., Elmore's Oct 18-**90**, Feb 14, 21-**91**; tempered, Eureka Co's product, com. report *F Inst* Dec -**90**; ores, electrolytic methods of reducing, Masson, abs. *Inst C E* v 108 -**92**, *Rev Mines* v 17 -**92**; produc. of world *R & Eng* July -**91**

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The Eng anal. of * Jan 17, 24-**90**; smelting, basic proc. as applied to, Jan 9; Elmore dep. proc. (machine) * Mar 6-**91**. See also METALS

Coral reefs and islands, Murray (full) *Sc Am Sup* June 15-**89**

Corliss, George H., por. *Pwr* * Mar, *The Eng* Mar 23-**88**

Corry, Alfred J. *Inst C E* v 110 -**92**

Cotton, culture in central Asia, Kittredge * *Soc Arts Mass* -**89**; fibre, Pray *F Inst* * Oct -**89**; mills, elec. power transmission for, Woodbury *El Rev* Nov 12-**92**; the Sun mill, Bombay *The Eng* * Apr 3, 3-**91**; spinning mule, hist., Stadler *Sc Am Sup* * Jan 17-**91**

Cotton-seed oil, industrial applics. of, Grimshaw *F Inst* Mar -**89**. See also OILS, cotton-seed

Counter, Snelgrove's *Eng* * Nov 21-**90**

Counting ap., Hollerith's elec., counting a nation by electricity (full) *El Eng* * Nov 11-**91**, (full) *El Rev* * Jan 26-**89**, Martin *Tech Q* Apr -**92**. See also CENSUS counting

Cowles, Eugene H., por. *E & Min* * May 14, *F Inst* May, por. *Sc Am Sup* * Sep 10-**92**

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Coxe, Eckley B., Kent, por. *Cassier's* * Dec -**92**, por. *E & Min* * June 27-**91**

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Crampton, Thomas R., ed. *Eng* Apr 27, *Inst C E* v 94 -**88**, *Inst M E* July, *The Eng* Apr 27-**88**

Cranes and derricks, *Am C E* travelling, componential trusses for Seaman, insets * v 23 -**90**; *Am M E* crane chains, experiences with, Dutton * v 11 -**90**; hydr. trav., Graves * v 12-**91**; trav. overhead elec., performance, Victorin * v 13 -**92**, *El Wld* Dec 10, *Iron Age* Dec 8; Am., Suplee *Cassier's* * Apr * May; trav. elec., Leonard's control system *El Eng* * Dec 14-**92**

Eng 12-ton steam Goliath, inset * Jan 3; 10-ton locom. steam * July 6; electrically worked, Anderson, Sep 14; 25-ton steam, Prince's Quay, Belfast har. * Nov 9; 20-ton overhead trav., Russell's * Dec 14-**88**; Whitaker's steam navvy * Apr 26; Paris exhib. * Sep 13-**89**; 100-ton, Belfast * Jan 24; 5-ton overhead trav., Belgium * May 2; 40-ton wharf * Sep 5; dredging and grab, the Cockburn * Oct 3; 100-ton trav., Fairfield boiler works * 24-**90**; 50-ton steam, Fairbairn * June 5; locom. steam * 19; derrick, stresses in, Elliott * July 10; 25-ton trav., Carron foundry * Sep 4-**91**; Morgan's and lifting appliances * May 27-**92**

E & Min hydr. trav., Graves * Feb 7-**91**; *E News* hydr. charging, inset, Feb 7; derrick plant for Equit. building, Denver, Col. * Aug 22; the Crosby wrt. iron tubular * Nov 28-**91**; Titan, at Leixoes, Portugal * June 30-**92**; 6-ton trav., for elevated road erection *E Rec* * Dec 17-**87**

R Gaz trav. and portable drills, etc., So. R. of France * Jan 13-**88**; 110-ton trav., Morgan engine works (full) * June 20; hydr. trav., Graves, Nov 21-**90**; pneu. * June 12; Ridgeway balanced steam hydr. * July 31; rope driven high speed * July 10; for railroad uses, Clements * Aug 14-28-**91**; 100-ton elec., Baldwin locom works, Bates, inset * Jan 29; trav. elec., Shaw * Mar 25-**92**; 10-ton trav. elec., Paris exhib. *Sc Am Sup* * Sep 21-**89**

The Eng 50-ton steam, Firming steel works, Feb 3; 150-ton trav., Abouchoff steel works, St. Petersburg, Feb 17, 17; 15-ton derrick, Butter Bros. Mar 2; 12-ton hydr. wharf, 30; 25-ton Fairbairn wharf, Apr 6; 3-ton locom. steam, Spanish R's, 6; trav., fly rope, 20; 10-ton breakdown trav., Indian State R. June 1, 1; 25-ton trav., Penn. R. July 6, 13, 13; 25-ton portable steam, New Zealand Gov't. R's, 27; 20-ton trav. elec., working of, Anderson, Sep 14; block setting Hercules, Douglass harbor

Cranes
works, Dec 14-**88**; 25-ton trav., Deptford elec. light station, Aug 23; 10-ton trav. elec., Paris exhib. 30; Guyenet system. Sep 6-**89**; crane posts, stresses in, cor. * Aug 29-**90** * Feb 13 -**91**; str., twin screw pontoon, Buarque de Macedo * Jan 1 -**92**. See also DERRICKS

Crank, crank pins securing, method of inserting, Collins *Am M E* * v 9 -**88**; a suggested new form of, Palmer, cor. *E News* * Sep 6-**90**; transmission expts. *Pwr* * Sep -**89**; the Edwards *Sc Am Sup* * Apr 14-**88**; cranks set on an angle * Oct 17-**91**

Cream separator, the Alexandra centrif. *Eng* * May 1-**91**

Cremation, prog. of, Cobb *E Mag* * July -**92**; Jenner *Sc Am Sup* July 28-**88**; of the dead, W. Clarke, May 3-**90**

Crematory furnace, Key's *Eng* * Mar 15-**89**; the Manchester crematorium (dead bodies disposal) * July 31-**91**; crematory at Zurich, Geiser, abs. *Inst C E* v 99 -**90**, *Schweiz Bauz* * v 14 -**89**

Criminology researches, Aaron *Sc Am Sup* June 18-**92**

Crookes, William, por. *El Wld* * Feb 7-**91**, por. *Sc Am Sup* * Apr 21-**88**, por. * Mar 7, 7-**91**, *Electrician*

Crosby, Oscar T., por. *El Wld* * May 31-**90**

Crosland, William M. *Inst C E* v 99 -**90**

Cross, Charles R., por. *El Wld* * Jan 3-**91**

Crossties, Railroad, life *E Mag* Apr -**91**; in France *E News* Dec 14-**89**; consumption of forest supplies by railroads, Tratman, table, Aug 30-**90**; preserving methods, Reed, Sep 20-**90**, Sep 19-**91**; consumption, France, Mathieu, abs. *Inst C E* v 98 -**89**, *Rev Chemins* July -**89**; treatment, Austrian R's, Karplus *R & Eng* Dec -**88**, *Vienna Zeit Eisen*; ties in India *R Gaz* Aug 23-**89**

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E News steel, maintenance expenses on, Post, June 30-**88**; some Am. June 29; the Flower-Heller * July 27; Z-iron, Belgium * Sep 7, report, 7; Mar 16, May 11, Nov 23-**89**; report, Aug 30-**90**; 'standard' steel * Feb 7; Servis, Apr 4; Belgian, July 18; Sandburg, Aug 22-**91**; Hartford steel tie and 100-lb rail, N. Y. Cen. R. * Mar 12-**92**

Inst C E metal sleepers, economic value, Hohenegger, abs. v 91 -**88**, *Org Forts Eisen* -**87**; value of pickling, Ribar

Crossties, METALLIC
Inst C E v 91 -**88,** *Zeit Ost* Ing -**87**; steel, manuf., inseparable clip type, Bamber *Inst C E* * v 108 -**92**; France *R & Eng* * June; Mayer * Oct -**89**; Europe * May -**90**
R Gaz Hartford steel * Dec 7-**88**; elastic tie plate, Sandberg's * Mar 8 * Apr 5-**89**; Penn. experimental * June 6: the Bonzano steel * Oct 17-**90**; Indian R's, June 5-**91**; Reece * Feb 19; N. Y. Cen. steel * July 22, manuf. of, Bamber * 22; Heindl steel, reports of use, Dec 23-**92**
Sc Am Sup * May 30-**90**; Hartford steel * Feb 9-**89**, *R Rev;* Indian State R. steel sleepers *The Eng* Nov 30-**88**; Cabry do., No. E. R. * Jan 4-**89**
Crowe, William M. *Inst C E* v 93 -**88**
Crowds, weight of *E Rec* Dec 24-**92**
Crushing and amalgam. mill, the Crawford *E & Min* * July 23-**92.** See also DISINTEGRATORS
Cryolite mine, Greenland *Sc Am Sup* Mar 14-**91**
Crystallization, Liveing *Sc Am Sup* * July 25-**91,** *Am J Sci;* crystals *Locom* Mar -**92**
Cuba, business opportunities, Chibas, insets *E Mag* * Nov -**92**; Havana, St. Jago trade in '87 *The Eng* Aug 3-**88**
Culvert, Harlem arch *E News* * Apr 26-**90.** See also RAILROADS, culverts
Cundy, John *Inst C E* v 109 -**92**
Cupola furnaces. See BLAST furnaces; FOUNDRIES
Curran, Henry B., por. *E & Min* * Dec 27-**90**
Current meter observations, Miss. river, report *F Inst* Apr -**88**
Curve ranger, Trotter's *Sc Am Sup* * Jan 11-**90** * Dec 12-**91,** *Eng, The Eng.* See also INSTRUMENTS; SURVEYING
Curves, the false ellipse, Wurtele *Am C E* * v 24 -**91**; the logarithmic, practical uses, Cox *E News* * Aug 29-**91**; radii of curvature geometrically determined, MacCord (full) *Sc Am Sup* * Jan 5-19 * June 22 * July 13 * Aug 3-**89** * Jan 11 * Oct 18-**90,** geomet. considered * Dec 10-**92,** instruments for drawing * Dec 28-**89** * Mar 29 * July 12 * Sep 20-**90** * Apr 4-**91** * May 14-**92**
Cyclones, whirlwinds *Sc Am Sup* * Aug 11-**88,** *La Nature.* See also STORMS; WIND
Cyclostyle duplicating ap., com. report *F Inst* Apr -**88**

Dady, Jamsetjee N. *Inst C E* v 92 -**88**

Daft, Leo, por. *El Wld* * Mar 30-**89**

Dakota, Black Hills, ore deposits, Carpenter (full) *Am Min* * v 17-**89**

Dams, or high-walls to resist the pressure of water, Francis, discuss., insets *Am C E* * v 19-**88**

E News great, of world, inset * Jan 7, 7; high masonry, theory of, Church, report * 14, do., Fteley, Feb 4, 11, det. of profile, Morley * Aug 11, Francis, an error of theory, ed. * Nov 17, earthern, how to build * 17, sluice gates * 24, strains in, Flagg, cor. * Dec 8, curved, Church * 22-**88**; and reservoirs, state supervision of, ed. Aug 24, 24-**89**; earthern vs. masonry, Follett, Jan 2,**92** flow of thick sheets of water over, Herschel * Nov 10-**92**

E Rec hillsides protection, Mahan * Dec 6-**90**; earth and masonry for irrig. works, Follett, May 14, 28; back water from, July 9; design of retaining walls, K. Allen, Nov 12 * 19-**92**

F Inst compound dikes (stone), most econom. cross-section, d'Auria * June -**88**; notable (Irrig. in India), Barois, *R & Eng* * Dec -**92**; masonry, design and construction, Wegmann, bk. *The Eng* Oct 26-**88**; dangerous, Sep 13-**89**. See also CANALS; EARTHWORK; HARBOR eng; HOLLAND dikes; IRRIGATION, India; RIVERS; RESERVOIRS; WATER-works

ATHENS, Ga., Ledlie *E News* * May 5-**88**

AUSTIN, Texas, Col. river *E News* * July 11-**91**; Fanning, report, Frizell * Sep 29-**92**

BEAR Valley, Cal. See DAMS, Sweetwater

BEETALOO water-works, So. Australia, concrete *Eng* * July 3-**91**; Moncrieff *E News* * May 30 * Sep 19-**91**; *R & Eng* * July -**91**; *The Eng* * May 8-**91**

BETHEL, Ct., water-works, and filter bed, proposed *E News* * Mar 7-**91**

BHATGARH *R & Eng* * Aug -**92**

BLACK Eagle Falls, Great Falls, Mont., Parker, discuss., insets *Am C E* * v 27-**92**; *E Rec* * Oct 8-**92**

BOIRE river *E News* * Apr 26-**90**

BUTTE City water-works, concrete masonry *E News* * Dec 15, 22-**92**

CAMBRIDGE water-works, Mass., Stony Brook, Barbour *E Rec* * Jan 5-**89**

CASTLEWOOD, Denver Water Storage Co. *E News* * Mar 22-**90**

Dams, COFFER-dams and floating caissons, R. Hunt *E & Min* * July 19, 26-**90**

CONEMAUGH, Johnstown, Pa. *The Eng* * June 21-**89,** *E Rec*

CROTON water-works, N. Y., Convent ave. gate-house *E News* * Sep 1, 15-**88**; inset * Nov 15, 15-**90**; inset * June 2-**92**; Fteley report *E Rec* * Oct 18-**90.** See also DAMS, Quaker bridge, Sodom

CURVED vs. straight, Bell *E News* Mar 31; strains in, Church, cor. * Dec 1, cor. * 28-**88**; cor. Aug 16; masonry, strains in, Martin, cor. Sep 27-**90**

DAVIS Is. movable, Ohio river, Pitts., Pa. *Sc Am Sup* * Aug 1-**91**

DENVER, Col., Citizen's water Co., large, n *E News* Sep 20-**90.** See also DAMS, Castlewood

ENGLISH, Sierra Co., Cal., destroyed *E News* * July 6-**89**

FOLSOM, Am. river, Cal. *E News* * Oct 17-**91,** *R & Eng* * July -**92**

HOLYOKE, Mass., Whiting st. *E News* * Sep 6-**90**

KINGSTON'S floating scouring *Eng* * Oct 26-**88**

KIRK wooden *E News* * Apr 28-**92**

LAWRENCE, Merrimac river, Hale *E Rec* * May 4-**89,** *J Assoc E Socs*

LUMBER, Penn., inset *E News* * Sep 5-**91**

MOVABLE, Pochet's (full) *Sc Am Sup* * May 24-**90,** *Genie Civil.* See also DAMS, Davis Is.

MUSKINGUM river *E Rec* * Mar 8-**90**

NEW Brunswick water-works, a dubious, Hill, cor. *E News* * June 16, proposed * 23-**88**

NILE barrage *E News* Sep 27-**90**

NORTHFIELD, Vt., a very bold arch *E News* * Sep 20-**90**

PAWTUCKET water-works, R. I. *E News* * June 1-**89**

PECOS river, N. M., rock fill *E News* * May 17-**90.** See also DAMS, reservoir

PERIYAR, Madras *Eng* * Nov 25, inset * Dec 9, construction *E Rec* * Dec 31-**92**

POTOMAC river, Wash. water-works, constructing, Chittenden, inset *Am C E* * v 18 -**88**

QUAKER bridge, Croton aqueduct, N. Y. water-works *E News* * Feb 4, table, 11, design of, ed. 25, Marichal, cor. Mar 10: report and ed., inset * Nov 3, 3-**88**; Fteley, Oct 11-**90**; map *E Rec* * Oct 6; report *R Gaz* * Oct 12, 26; Tratman *The Eng* Jan 27, Apr 20, Nov 30-**88.** See also DAMS, Croton

Dams, RESERVOIR, safety of, Kresnik *E & Min* * Mar 1-**90,** *Inst C E;* rock fill, ed. *E News* July 28, Aug 11, and Schuyler, cor. Sep 22-**88**; and Conn. law, ed. Aug 24-**89**; European, Kresnik, Mar 15; Apr 12; measures for safety of, do. May 10; and embankments for water-works, inset * June 21-**90.** See also RESERVOIRS; WATER-works

SODOM, Croton, N. Y. water-works, n *E News* * Dec 1-**88**; Oct 25-**90**; *Sc Am Sup* * Jan 5-**89**

SOUTH Fork reservoir failure, cause, com. report, discuss. (very full), insets *Am C E* * v 24 -**91**; *Eng* * June 7-**89**; and Johnstown disaster *E News* * June 15-**89**; com. report *E Rec* * Aug 29 * Sep 5-19-**91**

SWEETWATER, San Diego Bay, construction, Schuyler, discuss., insets *Am C E* * v 19 -**88**; and Bear Valley, do. *E News* * Apr 7, F. Brown (Redlands, Cal.) * June 23, Schuyler * Oct 27-**88**; Nov 23, 30-**89**; Schuyler, abs. *Inst C E* v 97-**89**

TANSA, Bombay water-works, inset *Eng* * Apr 29; *E News* * June 30-**92**; *E Rec* * Dec 19-**91**

VYRNWY lake masonry, Liverpool water-works *E News* Dec 29-**88**; and ed. * Aug 18-**92**; *R & Eng* * Jan -**89,** *Industries; The Eng* * June 27-**90**

WALNUT Grove, Ariz., disaster *E & Min* * Mar 1-**90**; *E News* Sep 22 * Oct 20, Nov 3-**88**; * Mar 8-**90**

WATER-works, of U. S., (list) *E News* June 15-**89.** See also RESERVOIRS; WATER-works

WESTPHALIA, Verse river, proposed, inset *The Eng* * Feb 1, 8 -**89**

Daniel, John, por. *E & Min* * Feb 28-**91**

Davenport, Thomas, (inventor elec. motor), Pope, por. *El Eng* Jan 7; some cor. *El Wld* Apr 25; *St R J* * Apr -**91**

Davidson, Robert, por. *El Wld* * June 20-**91**

Davy, Humphrey *Eng* Jan 8-22, Feb 12-**92**

Day, David T., por. *E & Min* * May 23-**91**

Death, Mitchell *Sc Am Sup* Oct 15-**92,** *Nat Sci;* origin of, Gardiner *Tech Q* July -**91**

Dean, John, por. *E & Min* * Dec 20-**90**

Debts, county, of U. S., diagram *E News* * Sep 6-**90**

De Camp, Edward F., por. *E & Min* * Sep 12-**91**

Decorticating machinery *The Eng* * Dec 27-**89**

De Lamar, J. R., por. *E & Min* * Sep 5-**91**

Delta metal, *E News* July 26-**90**

Denham, Henry M. *Inst C E* v 91 -**88**
Denny, Robert *Inst C E* v 95 -**89**
Denny, William (ship builder) bk. n *Eng* Jan 25-**89**
Dentistry, mechanics of, Sweet *Cassier's* Nov -**92**
Deserts, Am. Sahara, 'Valley of Death' *Locom* Jan -**91**; great, of the earth, James (full) *Sc Am Sup* June 22-**89**
Derricks, hydr. and steam, Brown Bros. *Eng* * Apr 18-**90**; stresses in, Elliott * July 10-**91**; hydr. hoist, H. M. S. Vulcan * Nov 18-**92**; derrick plant for Equit. building, Denver, Col. *E News* * Aug 22-**91**; 15-ton. Butter Bros. *The Eng* Mar 2-**88.** See also CRANES
Devonshire, Duke of (W. Cavendish) *Inst C E* v 107 -**92**
Diamond mining and industry, etc., polishing *Eng* * Feb 8-**89**; washing machinery * Apr 25-**90**; Kimberley stats., So. Africa, Sep 4-**91,** report Dec 23-**92,** do., Stonestreet *E Mag* * Aug -**91,** do. *E & Min* Sep 19, discov., Thorburn, Oct 24-**91**; Kimberley indus., Churchill, *Pop Sci* * Aug -**92**; mines, Africa *Sc Am Sup* * Aug 22-**91**; the De Beers mine *The Eng* Aug 17-**88.** See also GEMS
Dibblee, Frederick L. *Inst C E* v 97 -**89**
Dick, Charles *Inst C E* v 94 -**88**
Dickinson, George C. *Am C E* v 26 -**92**
Dictionary. See CENTURY dictionary
Diet, proper, for hot weather, Davies *Pop Sci* July -**92**
Dikes, Holland, notes, Starling, discuss., map, insets (very full) *Am C E* * v 26-**92,** do. *R Gaz* Nov 11-**92**; compound (stone), most economical cross-section of, d'Auria *F Inst* * June -**88.** See also CANALS; DAMS; RESERVOIRS; RIVERS, etc.
Dirks, Justus *Inst C E* v 92 -**88**
Disasters, in Aug., ed. *E News* Sep 8-**88**; great, earthquakes, floods, etc., ed. July 6-**89.** See also BRIDGE accidents; BOILER explosions; FLOODS; STEAMERS; RAILROADS, accidents, etc.
Discoveries, great, of past sixty years *Locom* Sep-Nov -**89**
Disinfecting ap., Koch, abs. *Inst C E* v 96 -**89,** * *Bul Soc Mul* -**88**; *Sc Am Sup* * June 30-**88,** *The Eng*
Disintegrator, the devil *Eng* * Aug 10-**88**; trials *The Eng* * June 27-**90.** See also CRUSHING, GRINDING
Disk, hollow cast iron, strains in, Leverich *Am C E* * v 18-**88**
Dividing engine, 40,000 lines to the inch, Rowland *E News* Feb 18-**88**

Diving boats *Eng* Mar 15, Apr 5-**89**; Stove's diving dress * Mar 28-**90**

Dixon, John *Eng* Feb 6-**91**, *Inst C E* v 104 -**91**

Docks, Auckland, N. Z., calliope graving, Swainson *Inst C E* v 101 -**90**

BARRY, works, J. Robinson *Eng* Apr 11-**90**, hydr. machinery and mode of tipping coal, discuss., insets *Inst C E* * v 101 -**90**

BOMBAY graving, proposed *Eng* * May 18-**88**

BRISTOL *The Eng* * Oct 14-**92**

BROADSIDE dock slip, for ships *Sc Am Sup* * Aug 8-**91**

BROOKLYN Navy Yard dry-dock, Simpson *Eng* * Aug 22, *R & Eng* June -**90**

CARDIFF schemes, Bute dock, map *The Eng* * Dec 9-**92**

CHATHAM *The Eng* * July 24-**91**

CUBA, crib for Signa Iron Co. *E News* * Apr 9-**92**

DRY-docks, of world *R & Eng* Aug -**89**; Wivenhoe *The Eng* * Feb 21-**90**. See also DOCKS, names of places

ESQUIMALT, Brit. Columbia, inset *Eng* * July 20, inset * 27-**88**

FLOATING, and pontoon, Taylor *Eng* * Aug 10, do. *Sc Am Sup* * July 7-**88**; offshore, Hamburg * May 10-**89**, do. *The Eng* * Mar 11-**92**; Limerick, steel gates, Hall *E Rec* Apr 10-**90**, do. *Inst C E* v 97 -**89**

GLASGOW harbor *Eng* * Aug 9-**89**; the Cessnock *E News* June 2-**92**

GRAVING *Eng* Nov 18-**92**, *Inst C E*. See also DOCKS, names of places

HALIFAX, Nova Scotia, graving *The Eng* * Feb 28-**90**

HAMBURG floating offshore *Eng* * May 10-**89**, *The Eng* * Mar 11-**92**

HAVRE port dry-dock *E Rec* * Dec 3-**87**, * *Genie Civil;* Bellot dock, Desprez, abs. *Inst C E* v 101 -**90**, *An Ponts* * v 17-**89**

HULL, Alexandra, Hurtzig *Eng* Feb 10, discuss., inset *Inst C E* * v 92 -**88**

INDIA, East & West, arbitration *Eng* Dec 28-**88**

LEAGUE Island dry-dock *E News* * Mar 14-**91**

LIMERICK, floating, gates, Hall *E Rec* Apr 10-**90**, *Inst C E* v 97 -**89**; failure of walls and methods for reconstruction, Hall, inset * 103-**91**

LIVERPOOL, port and Mersey river, dredging *Eng* * May 30 * June 6; Lyster, Jan 17, extensions, discuss., insets (very full) *Inst C E* * v 100 -**90**; Mersey estate *Inst M E* July -**91**

Docks, MARE Island, Cal., dry-dock *E Rec* * Feb 13-**92**
MARQUETTE, Mich., ore dock, Duluth, So. Shore & Atlan. R. *E & Min* * Jan 10-24-**91**
NEW York dock walls *E Rec* * Sep 3, Oct 1-**92**
PORTSMOUTH dockyard *Eng* July 29 * Aug 5, 5, lifting ap., Corner, 26-**92**
PRESTON scheme, ed. *The Eng* June 29-**88**
PUGET Sound, Wash., U. S. Naval station, inset *E News* May 19-**92**
SAN Francisco dry-dock, hydr., Union Iron works *R Gaz* * Nov 27-**91**
SOUTHAMPTON tidal *Eng* * Sep 12, inset *The Eng* * July 25 -**90**
Domestic motive power by atmos. exhaustion, Dollfus, abs. *Inst C E* v 93 -**88,** *Bul Soc Mul* -**88**; motors worked by rarefied air, Bourdenoot, abs. v 96-**89,** *Compt r* Feb 1-**89**
Dolivo-Dobrowolsky, Michael Von, por. *El Wld* * Mar 19-**92**
Dom Pedro, ex-Emperor of Brazil *Inst C E* v 108 -**92**
Douglass, Archibald Bryce- *The Eng* Apr 10-**91**
Dovetails, holding power of, Poe, report *E News* * Dec 20-**90**
Downes, Charles C. *Inst C E* v 92-**88**
Downing, Samuel F. *Inst C E* v 109 -**92**
Drainage, tables, G. Johnson *E News* May 5, 12-**88**; blunders, Webster *E Rec* * Dec 10, 24-**92**; hints, Chandler *Tech Q* Dec -**88.** See also SEWERAGE
CHARLESTON, S. C., tidal *E News* Oct 25-**90**
CHICAGO, drainage canal *E News* * June 2, 30-**92**; *E Rec* May 23-**91**
FENS and lowlands, by gravitation and steam power, Wheeler, bk., Spon, Lond. -**88**
HOUSE, domestic and water supply, Hartford *E Rec* * Apr 2, 16-**92**; Chandler *Sc Am Sup* Jan 26-**89,** *Tech Q*
LOUGH Erne, Price, discuss., inset (full) *Inst C E* * v 101 -**90**
KANKAKEE marsh, Chic. canal *E News* * Nov 3, 3-**92**
MEXICO, Valley of, Chism, map *E & Min* * Dec 8, 15, 22-**88,** map *E News* * Aug 10-**89**; City of Mex., hist. sketch, Noll *E Rec* Mar 16-**89**; Val. *Sc Am Sup* * Aug 10, map *The Eng* * June 28-**89**
WIESBADEN-Essen-Halle, abs. *Inst C E* v 96 -**89,** *Deut Vier Ges* -**89**
Draw-bridges. See BRIDGES, draw-bridges

Drawing, section lining, standard, Van Vleck *Am M E* * v 9-**88**; Holman *Cassier's* * Sep -**92**; drawing-board, vertical *Eng* * Jan 13, do. Vorth's *E News* Apr 7-**88**; section-liner and scale divider, Both's * Oct 12-**89**; T square, Deane's adjustable * Sep 13-**90**; essentials of mechanical drawing, Forney (very full) *R & Eng* * Mar – * Dec -**90** * Jan – * Dec -**91** * Jan -**92**; as a means of education, Ablett *Sc Am Sup* July 7-**88**; simple method (artistic), Jacquot * Mar 29-**90**. See also INSTRUMENTS, curve rule

Dredge, James, Wiley, por. *Cassier's* * Feb -**92**

Dredgers and excavators, Panama canal, Williams, insets *Am C E* * v 19-**88**; steam excavs., Clements *Am M E* v 9 -**88**; Bennett elec. and amalgamator *El Rev* * May 23-**91**

Eng double-ladder, Swansea harbor, inset * July 13; frictional gear for, Griffith * Aug 24; 'Kuphus' hopper, Bombay Port, inset * Dec 7-**88**; hopper suction 'Libana,' Port of Libau, inset * Jan 11; shore delivery for lake Copais * Feb 1; dredging cost, Apr 26-**89**; sand pumping, Mersey bar, ed. Apr 11, and docks * May 30 * June 6; Cockburn crane and grab * Oct 3-**90**; for excav. gold-bearing river beds * Jan 9; steam crane excav., Weser river imp. works * 16; dredging and amalgam. plant, inset * Mar 27; Manchester canal soil transporter, inset * July 24-**91**; floating elevator, transformation * Aug 19; Jupiter twin screw suction pump * Sep 30-**92**

E News Panama canal plant * Aug 18, 25; French suction, Vernandon * Nov 10-**88**; English, cost of, May 11; Lobnitz rock * Jan 26, work of * Oct 19-**89**; German stone * Aug 16-**90**; Man. canal soil transporter, Sep 5-**91**; ap. for N. Y. harbor, Edwards, inset * Mar 19; the Booth pump * 26; trestle filling, N. Or. & N. E. R. * Aug 4; dredging on Pac. coast, Miller, 4 * 11-**92**; Lobnitz rock, removal under water without explosives *E Rec* * Oct 12-**89**; four-screw hopper, Walker * Feb 13-**92**, do. inset *Inst C E* * v 107 -**92**; the von Schmidt, Higgins, inset * v 104-**91**; hydr., N. Y. harbor *R Gaz* Aug 28-**91**; Jandin's hydro-pneu, jointed conduit *Sc Am Sup* * Mar 9-**89**

The Eng dredging machinery, subaqueous rock, Suez canal, Mar 9; combined traction engine, crane and excav. 30; hopper, Glasgow exhib. Sep 7, 7-**88**; Wilson's single chain grab * Nov 28-**90**; hopper, for New So. Wales, inset * Apr 8; sand pump, Thyboron, inset * Sep 16-**92**. See also under CANALS; HARBOR eng.

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Dynamos

* Jan 30 * Feb 6; choice of a dynamo, considerations, Roberts, Oct 30, Nov 6; Frankfort exhib. * Oct * Nov * Dec -**91**; machinery, Hopkinson * Apr 15; waste field of, expts., Puffer * 15; relative weights and costs, Snell * May 20; cals. and designing chart, do. * June 3-**92**

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investigation (full) *El Rev* * Nov 8, do. *El Wld* * Nov 8-**90**; Kennedy *El Rev Lond* * June 1-15, 29-**88**; * May 17-**89**; curves showing performance, Lewis *El Wld* * Nov 14-**91**; machinery, Kapp *Eng* Feb 22, May 31-**89**, do. and discuss. (full) *Inst C E* * v 97-**89**; generators and receivers, Anthony *Soc Arts Mass* -**88**

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EDISON, and motor *El Rev Lond* * Aug 21-**91**; *Sc Am Sup* * Mar 5-**92**; Paris exhib. *The Eng** Nov 15-**89**

EICKEMEYER'S *El Eng** Mar -**88**

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FRITSCHE wheel *El Rev* * Apr 6, n *Sc Am Sup* * Apr 20-**89**

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LEEDS, the *The Eng* May 25-**88**

MORDEY alt. current *Eng* * June 1-**88**

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OERLIKON three phase alt. current *El Rev Lond* * Aug 28-**91**

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PLATING, Hopkin's *Sc Am Sup* * Mar 14-**91**

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PYLE aut. steam engine and (multiple cyl.) n *El Wld* * Aug 29 -**91**

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WESTMINSTER, the *El Wld* * May 18–**89**
WILLSON'S 1000 h.p. *El Rev* * July 4 (large) electroplating *El Wld* * July 4–**91**
WIRES sizes, table *El Rev Lond* Nov 16–**88**

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Eagles, Thomas H. *Inst C E* v 110 –**92**

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ACCUMULATORS. See STORAGE batteries

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AGRICULTURE, in, cost, ed. *El Eng* May 11-**92**

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ALTERNATORS coupling in series, Boucherot *El Wld* * Dec 27 -**90**

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AMPERE and volt meter, Sankey *El Rev Lond* * Nov 27, Dec 4-**91**. See also ELEC. meters

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Electric APPARATUS

Siemens Bros' *Eng* * July 8, 15 * Aug 5, 19, 26 * Sep 2–16–**92.** See also DYNAMOS, room appliances; RAILROADS, elec. power stations appliances

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Electric COMPANIES, Edison

14-**91**, rep. July 22, pat. hearing, Aug 5, Am. pat. decision, Oct 21-**92**

El Rev Edison vs. U. S. Elec. Lighting Co., decision, May 26-**88**; incand. lamp pats. in Canada, Mar 23; Illum. Co's pro. Aug 24-**89**; General Co. report, Jan 31; decision (very full) * July 25, Aug 1-**91**; and Thomson-Houston consolidation, Feb 13; incand. lamp suit (full) May 7, filament pat. decision, July 2, decision, sup. Oct 8, ed. n 15, Dec 24 -**92**

El Wld Edison works, Schenectady, N. Y. (full) sup. * Aug 25-**88**; Canada decis. (full) Mar 23-**89**; Edison General Co. report, Jan 24; incand. lamp pat. suit, vs. U. S. Elec. L. Co., ed. (full) * June 6, 13, 20, July 18-**91**; General Co. report, Feb 20; and Thomson-Houston consol. Feb 13; incand. lamp case, May 14, Dec 17, opinion, 24-**92**

Eng Edison, Paris, June 14-**89**; and lighting ap. manuf., Thomson-Houston works, Lynn, Mass. *E News* * June 30, July 7, 14-**88**; incand. lamp pats. * Apr 25-**91**, validity in Great Britain, decision *E Rec* Aug 4-**88**; Co's consolidations *Sci Am* Mar 2-**89**; incand. lamp pat. decision *Sc Am Sup* Aug 8-**91**; and Swan, legal trial *The Eng* July 20, decis. Dec 21-**88**

EDISON General Co. report *El Eng* Mar -**90**, Feb 17-**92**, *El Rev* Jan 31, *El Wld* Jan 24-**91**, Feb 20-**92**

GENERAL, Edison and Thomson-Houston consolidation, ed. *El Eng* Feb 10, *El Rev* Feb 13, *El Wld* Feb 13; organization, pors. * May 14-**92**

SWAN United Co. *El Rev Lond* June 8-**88**; and Edison, Aug 2-**89**, Aug 1-**90**, July 22, pat. hearing, Aug 5; report Dec 2 -**92**; and Edison, legal decis. *The Eng* Dec 21-**88**

THOMSON-Houston Co. report *El Eng* Apr 30-**90**, Apr 22-**91**, do. (full) *El Rev* Apr 18-**91**; and Edison consolidation *El Eng* Feb 10, *El Rev* 13, *El Wld* 13; General Co. organization, pors. * May 14; report, Apr 16, *El Rev Lond* Apr 29; works, Lynn, Shaw, plan (full) *El Eng* * June 29, do. *St R J* * Aug * Sep -**92**. See also ELEC. Co's. General

WESTINGHOUSE, Edison litigation *El Eng* June, Nov -**89**; works, Pitts., Wetzler (full) * Oct 19-**92**; Co. report *El Rev* July 19-**90**; circular, May 16-**91**; report, May 28-**92**; shops, overhead cranes in *R Gas* * July 19-**89**

Electric CONDENSERS, history, development and applics., Maver *El Eng* * Jan -**89**; oscils. in charging of, Robb *El Rev Lond* * Dec 16; spark and air jet expts., E. Thomson * Mar 25, *El Eng* Feb 17, *El Wld* * Feb 27-**92**; influence on disruptive discharges, Acheson *El Rev Lond* * Aug 10 * Sep 28, cor. *El Rev* July 7-**88**; eccen. cylinders problem, Kennelly *El Wld* * Nov 26; future in elec. lighting, Swinburne * Jan 9, 16-**92**, *Industries*

CONDUCTORS, anti-effective cop. in parallel or coiled, for alt. currents, W. Thomson *El Wld* * Sep 27, *El Eng* * Sep 24-**90**; insulated, Bowstead, Mar 16-30, Apr 6, 13, do. Williams, Aug 17, 31, Nov 30-**92**; absolute vacuum as a non-conductor, Weyde *El Rev* * Dec 22, *El Wld* * Dec 22-**88** *Sc Am Sup* Jan 19, *El Rev Lond* Jan 11; size cal., Kempe, May 24-**89**; electrostatic force between, Lodge (full) Oct 10; econ. in, Kilgour, Dec 12, 19-**90**; insulated, spec., Preece, Dec 11, 18-**91**; heating of by elec. currents, Kennelly *El Wld* * Nov 23, diags. 30 * Dec 7, 14-**89**; law of economy, Santarelli, July 26, Aug 2; econ. in, Kilgour, Dec 27-**90**; most econom. loss, Roberts, July 18, 25, Aug 29-**91**; relation between rise of temp. and current, Wadsworth * Feb 27 * Mar 12; molecular movement in, Dolbear * Apr 9-**92**

CONDUITS, Chenoweth's, com. report *F Inst* Sept -**89**; elec. system, Harding *El Rev* * Dec 6-**90**; elec., Interior and Insulation Co. system, com. report, Johnson * Mar -**91**

CONGRESS, Paris internat. '89 *El Eng* Nov, Dec -**89**, *Industries*, (full) *El Rev Lond* Sep 6-27, Oct 4, *Eng* Sep 6-27-**89**; Frankfort internat. Sep 18, 25-**91**

CONSTANT shunt method, errors in, Puffer *Tech Q* Feb -**88**

CONSTRUCTION Co., Bushbury, England *The Eng* Nov 27-**91**

CONVERTER, Ferranti and meter *El Wld* * Dec 15-**88**; Westinghouse, effic. tests, Cross * Jan 18-**90**

COPPER tempered for elec. work, Bliss *El Wld* Feb 1-**90**; manuf, F. E. & A. S. Elmore pats. *E News* Oct 18-**90**; depositing proc. Feb 14, 21-**91**. See also COPPER

COUNTER and shaft rev. indic., Weaver *El Rev* * Apr 11-**91**

CRANES, 10-ton travelling, Paris exhib. *The Eng* * Aug 16-**89**. See also CRANES

CURRENTS, *El Eng* alternating, energy of, Shallenberger * Mar; distrib. by, T. C. Smith, Mar; heating effects, Preece, tables, June, *Industries;* vs. contin., Slattery, May, Cutter, Bliss *El*

Electric CURRENTS

Eng * July; det., constant shunt method errors, Puffer, July -**88**; mod. views, Rowland, June; alt., working, Mordey (full) July, Aug * Oct -**89**

El Eng alt. ap. effic. tests, Duncan * Apr 2; heating effects, Preece, June 11; alt. ap. expts., Ryan * July 2; alt., rectifying by synchronizing devices Steinmetz, 16; in aerial telegraph conductors, obs., Bennett * Sep 10; alt., in parallel conductors, W. Thomson * 24-**90**

El Eng earth curs., Finn, Jan 14; alt., distrib. and care of, T. C. Smith, Feb 25; alt., high frequency expts., Tesla * Mar 18, 18, E. Thomson, Mar 11, Apr 1, Tesla, May 27 (full) * July 8; curves of flow, ap., Frolich * Aug 3-**91**; alt. cur. motors, Stanley * Mar 2; underground op. of high tension, Leslie, 2; alt. expts., Duncan * Sep 7; alt. high tension, Siemen's expts., Cammer * Nov 9-**92**

El Rev Lond phases difference, Ferraris * Feb 3-24; alt., Westinghouse vs. Sun Co. decision Boston, Sep 7; alt. vs. direct, comparative danger, Weyde, Oct 5-**88**; alt., power transmission difficulties by, Reymond (full) * Feb 1; alt. machinery, Kapp, Mar 1; induced strength, Cross, Wins * May 24; high vs. low tension, 31; alt. working, Mordey (full) May 24, 31, June 14, Aug 2; nature, Rowland, July 12; alt. and steady relative effects on conductors, Preece * Sept 27 -**89**

El Rev Lond alt. and contin., respective merits, Jan 10, 24; alt., in relation to human body, Lawrence, Apr 4; distrib. in networks of elec. conductors, Herzog (full) * Apr 18 * May 2; alt. ap. effic. tests, Duncan, Apr 18, 25; high tension underground circuits, Brit. authorities on, 18; alt., induction, E. Thomson * 25; alt., storing up, Foeppl * May 16, 23; in telegraph conductors, Bennett * July 25; what constitutes a dangerous, Perry, Aug 29, Sep 5; dangers, Morton, 12-**90**; alt., of high frequency, Tesla, Mar 6, Apr 3, physiological effects of, E. Thomson, Mar 20, Apr 17, Tesla, Thomson, May 22, expts., Tesla (full) * July 24, 31 * Aug 7; alt., condensers, Swinburne, Apr 3; rotary and art of measuring them, Gorges * Apr 17, 24; measurement of power supplied by to any circuit, Ayrton * 24; alt., flow effects, Fleming * May 8-22; rotary, expts., Bois-Reymond * June 5; work and magnetic det. in armatures, Hummel * Oct 2; alt., polyphased * Oct 17-30 * Nov

Electric CURRENTS

6-20 * Dec 25 -**91**; alt., power development, Hering * Jan 15, 22; alt. expts., Siemens (full) * Mar 4; earth curs., Preece, Aug 19; alt. and elec. mo. force quantity diag., Whitwell * Dec 2-**92**

El Rev alt., Shallenberger * Mar 17; alt. vs. contin., Slattery, 24; constant shunt method errors, Puffer, Apr 21; contin. vs. alt. cur. unlimited, Bliss * June 9; alt. vs. direct, comparative danger, Weyde, sup. Sep 8-**88**

El Rev mod. views, Rowland * June 8-**89**; alt. high tension circuit, Jacquin, Mar 22, *Lum Elec* Feb 25; alt. effic. tests, Duncan *El Rev* Apr 5; heating effects, Preece, June 14; alt., properties, E. Thomson, Nov 22-**90**

El Rev alt., interference with, Ayrton, Apr 4; alt., of high frequency, Steinmetz, 4, Tesla, May 30, very high frequency, do. (very full) * July 11; German cur. transformer * June 20; alt., polar diag. and applic. to inductive resistances, Steinmetz (full) * 20; cur. curves det., Frolich * Dec 19; alt. polyphased * Nov 28-**91** * Jan 16; alt. arc air blast for raising frequency, Thomson's * Mar 12; alt. expts., Duncan * Aug 6-**92**

El Wld alt. and undulatory, elec. wave and phase indicator for, E. Thomson * Jan 28; heating effect of, Preece, table, May 19; contin. vs. alt. unlimited, Cutter, June 2, 9; alt., admission into N. Y. City, cor. (full) July 28; alt., danger of, physiological tests, H. P. Brown (full) * Aug 11, Gutmann, Set 8, 22; alt., Westinghouse vs. Sun Co., Boston decision * Aug 25-**88**

El Wld nature, Rowland (full) * June 1; alt. and contin., comparative danger to life, H. P. Brown's expts. review, Gutmann, cor. July 13; contin. direct from alt. circuits, Tesla's method * Nov 2, do. Gaillard * 2; contin., obtaining from alt. curs. without mechan. commutators, Ries * 23-**89**

El Wld alt., peculiarities, Sumpner, Jan 11; alt. ap. effic. tests, Duncan * Apr 5; alt. induction phenomena, E. Thomson, and discuss. 19; alt. vs. contin. in relation to the human body, Lawrence, 26; distrib. in networks of elec. conductors, Herzog (full) * May 3 * Aug 23; physiological expts. with, Tatum, 10, correction, 17; alt. ap., Ryan * July 5; alt., in parallel conductors, W. Thomson * Sep 27-**90**

El Wld arc, stabled by the regulator, Higham * Jan 17; earth curs. phenomena, Finn * 24; alt., of very high frequency, Tesla, Feb 21, E. Thomson, Mar 14, Tesla, 21, Apr 11, (very full)

Electric CURRENTS

* July 11; alt., distrib. and care, T. C. Smith, Feb 28; alt. flow effects, Fleming (full) May 23 * June 13-27; alt. potentiometer, Moler * May 30, discuss. June 13; rotary, expts., Bois-Reymond * 27; alt. and poten. difference analogies in measurement of power, Ayrton * Aug 22, 29-**91**

El Wld alt., measurement of power in any circuit, Hering * Jan 2; alt., some phases of, Evans, 23; conductors, relation between size of wire and cur., Wadsworth * Feb 27 * Mar 12; op. underground high tension from a physical and financial standpoint, Leslie (full) Mar 5; alt., measurement of the lag between, Holz * 26; alt., of high frequency, Tesla's expts., Raverot * 26, and high poten., expts., Tesla (very full) * May 7; cur. controllers for medical work, Waters * Apr 23; alt., of high poten. and low frequency, expts., Perkins * 30; alt. distrib. systems with condensers, Reckniewski * June 4; alt., expts., Duncan * Aug 6; polyphased, Winand * Nov 12; earth curs., Finn, 19-**92**

E News heating effec on insul. copper wire, diag. * July 11-**91**; induced, an experimental analogue for direction of, Rondinella *F Inst* * May; high voltage, value of oil as an insulator Brooks, n June; induction of and induction coils, E. Thomson * Aug -**91**; polyphased, Winand (full) * Oct -**92**; alt., and applics., Tesla, abs. *Inst C E* v 106 -**91**; alt., distrib. and care of, T. C. Smith *Pwr* Apr * May -**91**

Sc Am Sup alt., dynamic rotation by, Ferraris * July 7-**88** * *Industries;* contin. and alt., comparative merits, Rühlmann, *Sc Am Sup* Jan 18; effects of heavy, Hopkins, Apr 5-**90**; alt., of high frequency, Tesla (full) Mar 7; two or three phase alt. systems, Hering * Oct 3-**91**; alt. systems, Low, Feb 6; op. of underground high tension, Leslie, Apr 2-**92**; alt., expts., E. Thomson * *Soc Arts Mass* -**90**; death by, Houston *The Eng* June 22; heating effects of, Preece, July 6-**88**

CUT-out, Fisher aut. *El Eng* * May 4, *El Wld* * May 7-**92**

DIAGRAMS and symbols, chart, Crocker *El Eng* * May 13-**91**

DICTIONARY, Houston *El Eng* Nov -**89**; proposed, Benjamin, June 22; Houston, July 6-**92**, do. bk. review *El Wld* July 20-**89**, June 11-**92**

DISCHARGES, disruptive, in lead cables, Rudd *El Eng* * Mar, *El Rev Lond* Mar 15-**89**; stratified, expt., Brooks * Apr 1-**92**; motion of atoms in, Trowbridge *El Rev* Dec 13-**90**; disruptive, influence of condenser on, Acheson *El Wld* * July

Electric DISCHARGES
7; disruptive and relation to underground cables, Acheson * Sep 8-**88**; of a Leyden jar, Lodge (full) *Sc Am Sup* * Apr 27 -**89**

DISTRIBUTION, *El Eng* contin. and alt. cur., comparative value, Leonard, Apr -**88**; Huntley's zone system * Sep 16-**91**; multiple arc, det. of wire for, Woodbridge, Apr 13; three-wire system, new, Leonard * June 8-**92**

El Rev Lond system, Edmunds * Nov 30-**88**; Webber, Feb 6, 20; Kennedy's method * Mar 20, 27 * Apr 10, 24-**91**; by alt. curs. and transformers, Kennedy, Apr 22 * May 6, 20, 27, by multiphase curs. do. * Sep 9; improvements * Dec 2; three-wire system (full) 9; multiphase transmiss., Reckenzaun, Apr 29, Dec 30-**92**

El Rev distrib. by alt. curs., Carpenter, Mar 3; converter and contin. cur. systems, compar. value, Warner, Apr 14-**88**; Patten system * Nov 23, 30-**89**; developments, Forbes, Mar 19 -**92**

El Wld distrib. by alt. curs., T. C. Smith * Mar 3; contin. and alt. cur. systems, compar. value, Leonard * 24; system, Edmunds * Oct 13-**88**; Edison three-wire system, Jenks (full) * July 20-**89**; distrib. of energy by constant curs. Bernstein * Jan 25; by transformers from central and eccentric stations, Ganz system, Fleming (full) July 26 * Aug 2-30, Sep 6 * Oct 25 * Nov 1-15, 29 * Dec 6, 27-**90** * Jan 10, 24, 31 * Feb 14; econ. in conductors, Kilgour * Jan 10; practical prob., Roberts, Sep 5-**91**; and transmiss., multiphase, Reckenzaun * May 21, June 11; by multiphase curs., Kennedy * Oct 1-**92**

Eng Edmunds' system * Nov 23-**88**; prob., Brooklyn subway com. report *E & Min* Jan 11-**90**; by constant cur. system, Bernstein, abs. *Inst C E* v 99 -**90** * *Elek Zeit* -**89**; by multiphase curs., Kennedy *Pwr* Nov -**92**; systems, Stanley * *Soc Arts Mass* -**88**

DOCKYARDS and navy, elec. applics. to, Deadman *El Wld* Aug 13, 20, Sep 10-**92**

DOMESTIC uses, for, Leonard *El Wld* * Jan 30-**92**

DRILL, percussion, Marvin *El Eng* * Aug 17, *El Rev* * Aug 13, (full) *El Wld* * Aug 13-**92**

DYAMOTOR, Lahmeyer triphase *El Rev* * Jan 9-**92**

DYNAMIC lines, direct optical projection of, Moore *Sc Am Sup* * Apr 21, 28 * May 5-**88**

Electric DYNAMOS. See DYNAMOS

EIFFEL tower plant *Eng* * June 21-**89**. See also under ELEC. lighting

ENERGY, from carbon without heat, Case *El Wld* Jan 14, 21, *Sc Am Sup* Jan 21, *El Eng* Feb -**88**; from solar radiation, Osmond, Mar -**89**; conversion of mechan. into elec., Arnall *El Rev Lond* * Feb 27; cost, ed. Apr 17; Frager's energy meter * June 19-**91**; measurements of, Potier, Sep 7-**89**; distrib. of, by constant curs., Bernstein * Jan 25; util., Watts, July 12-**90**; generation and distrib. of, cost, Crompton, and discuss., insets (very full) *Inst C E* * v 106 -**91**; conversion of heat direct, Gülcher, abs. v 105 -**91**, *Sitzung Akad Wissen Berlin* v 19 -**91**

ENGINE, magnetic recip., Van Depoele *E News* Oct 4-**90**

ENGINEERS, Am. Inst. Trans. and pro. files **88-92**; pors. *Cassier's* * Aug -**92**; (full) *El Eng* * Jan-Mar, May, June, Nov, Dec -**88**; Jan, Feb, Apr, W. Thomson, addr. May, June, July, Oct-Dec -**89**, Jan, Feb, Apr 2, May 28-**90**; *El Rev Lond* Jan 18, 25 * Feb 22, Mar 8, 15 * Apr 5, 26, May 3-17, 31, June 7, 14 * Nov 15-29, Dec 6-20-**89**, Jan 17, 31, Feb 14-28, Mar 7, 14, 28, Apr 4, 18, May 16 * 23, 30, June 6-20 * July 18-25 * Aug 1-15, Nov 28, Dec 5-19-**90** * Jan 16, 23, Feb 6, 20, 27 * Mar 6 -20, Apr 10 * May 1-22 * June 5 * Nov 27, Dec 4-18-**91**, Jan 29 * Mar 4-25, Apr 1, 15, May 6-27, June 3, 24, Oct 28, Nov 25, Dec 2-30-**92**; and discuss. (full) *El Rev* * Sep 28-**89**; *E News* July 21-**92**; *The Eng* Jan 13-**88**

ENGINEER's technical education, Jackson *El Rev* June 25-**92**

EVAPORATION, Crookes *El Eng* * July 15, *El Rev* * July 18, *El Wld* * July 11, 18 (full) *Sc Am Sup* July 18-**91**

EXCAVATOR (motor), Osgood Dredge Co. n *E News* * Sep 20 -**90**

EXECUTION, Moses *El Rev* Aug 17-**89**; Kemmler's, Talbot, Apr 25-**91**; Heinrichs *Sc Am Sup* Aug 10-**89**. See also ELECTROCUTION

EXHIBITIONS, Crystal Palace *El Rev* Apr 30, *Eng* * Mar * Apr, July 1, *The Eng* * Jan-June -**92**

EDINBURGH *El Rev Lond* * Aug 1, 22, *The Eng* * July 11, 25 * Aug 15, 29 * Sep 26 * Oct 10-**90**

FRANKFORT *El Eng* July 15 * Aug-Oct-**91**; notes, Hering *El Wld* Jan 9-**92**; Paris, notes, Oct 5, 12-**89**. See also EXHIBITIONS

Electric FIELD, magnetic, change of form affecting, Dolbear *El Rev Lond* * Mar 27, *El Wld* Mar 14, *El Eng* * Mar 11-**91**, graphic representation, Houston * July 20, *F Inst* * July, insets * Sep-**92**; Gray *El Rev Lond* Oct 19 * Nov 2, 9-**88**; physical fields, cor. Jan 24, Feb 21, Apr 11-**90**; a permanent magnetic, Hibbert * Aug 5; the Schuckert field motor * 19-**92**; rotary, kinematics of, Kelly *El Wld* * Apr 16-**92**

FIRE engine, Dewey's *El Rev* * Mar 7-**91**; Fish, Apr 12-**90**

FITTINGS, house, N.Y., Martin *El Eng* * May 25-**92**; in the dwelling, Allam, *Sc Am Sup* Mar 15-**90**

FIXTURES, exterior *El Wld* * Dec 5, 12-**91**; decorative, Wall *E Mag* * Oct -**91**

FORGING, Burton system *El Eng* * Jan 27-**92**, do. spike machine *El Rev* * Sep 13-**90**

FORMULAS, relation between magneto motive force and resulting magnetization, Emery *El Eng* * Aug 17-**92**

FRAUDS, Knudson *El Eng* Jan 6-**92**

FURNACES, early forms, Pepy's, Houston *F Inst* Jan, Depretz's, Lontin's, Feb, Johnson's, Watson & Prosser's, Apr * June, Werdermann's, July -**88**, do. *El Rev Lond* Apr 6, 27, June 1 * Aug 24-**88**; first * Aug 5-**92**; Edison's *Sc Am Sup* * Oct 31-**91**

FUSES and safety cut-outs, Bathurst, *El Wld* * May 10-**90**

GALVANOMETER, standard ballistic *El Eng* * Nov 16-**92**; mag. and telegraphic, chronol. hist., Mottelay *El Wld* Jan 2-30, Feb 6-27-**92**. See also GALVANOMETERS

GENERATORS, thermo-elec. *El Eng* * Sep 3, Edison's novel * 3, gaseous * 10-**90**; commercial rating of, Grier, Jan 28; constant cur. regulation * Apr 15; Edison's direct gen. from carbon, n * Oct 7; polyphasal, Pupin * Dec 30, (full) *El Wld* * Dec 26 (full) *El Rev* * Dec 26-**91**, discuss. * Jan 16-**92**; distrib. and measurements, Lawson *El Rev Lond* June 27, *Can C E*, *El Wld* May 24-**90**; Edison pat. *El Rev* * Aug 30 * Sep 20-**90**; Brush alt. cur. system *El Wld* * July 13-**89**; commercial rating, Grier, Jan 24; reg. of constant cur., Dow * Apr 11-**91**; alt. cur. and receivers, Anthony * *Soc Arts Mass* -**88**; catelectric, Acheson's *The Eng* Aug 23-**89**, *El Wld*

GIRL exposé, Perry *El Rev Lond* * Dec 18-**91**, *Sc Am Sup* * Jan 2-**92**

GROUND detector, Edison's, Kennelly *El Rev Lond* July 27, *El Wld* * July 7-**88**

Electric HANDWRITING, transmission of, Gump, *Soc Arts Mass* -**89**

HEAT excitement in electrolytes, Planck *El Rev Lond* Apr 4, 18, 25, May 2, 16, 30, June 6, 13-**90**; regulation system *El Wld* * Mar 1-**90**

HEATERS, Gutmann's n *El Eng* * Aug 26-**91**; Burton, n *El Rev* * May 10; Abshagen's pat. * Oct 11; for cars, Hanna * Dec 6; Talmage pat. * 27-**90**; defence of, Burton, cor. *E News* Aug 23-**90**; Merrill, May 19-**92**

HEATING, Dewey's *El Eng* * Oct 5-**92**; effect of elec. curs., Preece, tables, June -**88**, June 11, do. *El Rev* June 14-**90**, do. table *El Wld* May 19, do. *The Eng* July 6, do. *El Rev Lond* May 11-**88**; of wires and lamp filaments, Rain, Dec 6 * 13; of conductors by curs., Kennelly (full) * Dec 6, 20, 27-**89**; of thin wires, Bernstein *El Wld* Apr 27-**89**; of cop. wires., Barbieri * Mar 14; Dewey * Oct 3; thermal emissivity of thin wires in air, Ayrton, Kilgour, Dec 19-**91**; as compared with coal direct, Stern, n Dec 24-**92**; and smelting, Emmens *E & Min* July 16-**92**; effect on insul. copper wire, diag. *E News* * July 11-**91**; effect of curs., Preece *Sc Am Sup* Aug 18-**88**; Dewey * Oct 24-**91**

HERTZ'S expts., Joubert *El Rev Lond* * Aug 30-**89**, undulations, Bertolini *El Wld* * Jan 10-**91**, *Eng*, *Sc Am Sup* * Oct 5-**89** * Jan 25-**90**

HISTORY. See ELECTRICITY, history

HORSE power, for lighting, motor and railroad circuits, table, inset *El Eng* sup. Feb 25-**91**; characteristics, diag., Crane *El Wld* * July 13-**89**; curves, Herzog's, diag. * Mar 26-**92**; *Sc Am Sup* Sep 19-**91**; ed. *The Eng* Aug 21-**91**

HOUSE fittings, N. Y., Martin *El Eng* * May 25-**92**; Allam *Sc Am Sup* Mar 15-**90**

HYSTERESIS, loss by, Tesla reply to E. Thomson *El Eng* May 7; law of, Steinmetz * Dec 17-**90**, Jan 27 * Feb 3-17 * Mar 9, 16, 16 * Oct 12-**92**, (full) *El Rev* * Jan 30 * Feb 13, 27, Mar 12 -**92**, do. abs. *Inst C E* v 109-**92**, *Am Elec Engrs* -**92**, do. (full) *El Wld* Jan 30 * Feb 6, Oct 29-**92**; and Foucault losses separation, Kapp * May 2-**91**; measurement in, Evershed * Oct 15, 22-**92**

ICE-harvesting machinery, Kinsman *El Eng* * Dec 30-**91**

INDEX of current elec. lit. *Am Inst Elec Engrs* May -**88** and files

Electric INDUCTANCE and proposed unit 'the Henry,' Kennelly (full) *El Wld* * Dec 27-**90**

INDUCTION *El Eng* coil retardation in, Stanley (full) * Jan, Jan, do. *El Rev Lond* Jan 13; Slattery system *El Eng* * Mar -**88**; self-induc., Acheson, notes * Apr; measurements by telephone, Strecker * Oct -**89**; alt. cur., E. Thomson * Apr 9; self-induc., industrial util. of counter elec. mo. force of, Lockwood, May 28, do. (full) *El Rev Lond* Aug 29, do. *El Wld* May 31; and proposed unit 'the Henry,' Kennelly, Jan 9, Feb 20-**91**, do. (full) *El Rev* * Dec 27, do. (full) *El Eng* * Dec 24-**90**, Feb 4-**91**; by high poten. discharges, E. Thomson * Feb 17, do. *El Rev Lond* * Mar 18, do. *El Wld* * Feb 20; dynamic, at high potens. and frequencies * Apr 15, do. *El Rev* * Apr 2, do. *El Wld* * Apr 2, do. *Sc Am Sup* * Apr 23, do. *El Eng* * Mar 30 -**92**

El Rev Lond coils expts., Duncan * June 15, do. *El Wld* * Apr 28 * May 19 * Aug 18-**88**; general law in circuits without resistance, Lippmann *El Rev Lond* Aug 23-**89**; electro-magnetic expts., E. Thomson's, Fleming * May 23, 30, do. (full) *El Wld* * June 14, 21, do. (full) *Sc Am Sup* * Aug 9, 16; and coils, Moon *El Rev Lond* Dec 12-**90**; in multiple core cables, Dresing * May 22-**91**; multiple machine for high tension electricity, Armstrong * July 22, 29-**92**; Carty, discuss., Kennelly (full) *El Rev* * Apr 11-**91**

El Wld self-induction measuring by Ayrton & Perry's secohmeter * Apr 20; mutual null method of measuring, Kennelly * Oct 5-**89**; electro-mag., simple deductions from first laws of * Jan 11; alt. cur. phenomena, E. Thomson and discuss. Apr 19; self-induc. of a circular loop, Blathy, May 31-**90**; self-induc. of coil, det. from its dimens., Place, Nov 26; self-induc. effects, Bedell, Dec 24-**92**

Eng Huyghen's gearing, Rayleigh, May 30; alt. cur., E. Thomson * Aug 1, ed. 15-**90**; unipolar, Hoppe, abs. *Inst C E* v 92 -**88**, *Elec Zeit* -**87**

INDUSTRY and eleventh census, table, Garratt *El Rev* Oct 26-**89**

INFLUENCE machine, Wimhurst's alt. *El Rev Lond* * Apr 24, *El Wld* * May 9-**91**, *Eng* * May 4-**88** * Apr 17-**91**, *Sc Am Sup* * May 26-**88**; theory, Gray *E Rev Lond* * Aug 12, Taylor * Oct 7-21-**92**

INSTRUMENTS, manuf. in Am., Wetzler (full) *El Eng* * Feb 24-**92**; Mather Elec. Co. *El Wld* * Mar 24-**88**

Electric INSULATION, *El Eng* and installation of wires, E. Thomson, Mar, do. *El Rev Lond* Mar 23, do. *El Rev* Feb 25-**88**; resist. of elec. light installs., Jamieson, Jan 25, do. *El Eng* Oct -**89**; resist. measuring, Patterson * May 20-**91**, glass and porcelain, tests, F. Jones, Feb 10; Edison, July 13, do. *El Wld* July 2, do. *Sc Am Sup* Aug 6, do. *El Rev* July 2; oil vs. air as, Wins, Nov 26, do. *El Wld* Nov 26, Dec 3-**91**, Dec 10-**92**, do. *El Eng* * Nov 23; resist. of cotton and silk covered wires, Luquee * Dec 28; micanite and applic. to armature insul., E. Thomson, 28, do. *El Rev* * Dec 31, do. *El Wld* * Dec 31-**92**

El Rev Lond insul., okonite, June 8; Picou, Nov 23-**88**; resist. of station, Jamieson, Jan 25; measurements at the Vienna Palace, Waltenhofen * Feb 15, 22; standard for light circuits, Fish, 15; thickness of, A. Thompson, 22-**89**; of cables, influence of elec. tension on, Palaz, Oct 24-**90**; high, of wires, commercial measurement, Hering * Mar 27-**91**; oil, as, expts., Hughes, Mar 11-**92**; in marine work, hist. *El Rev* Dec 14-**89**; insul. materials behavior under high poten. differences *El Wld* * Apr 9-**92**; wire insul. measurement, Picou, abs. *Inst C E* v 92-**88**

INSURANCE, light and power rules, Boston Manuf's. *El Eng* Aug 20; rules, Hartwell (full) *El Rev Lond* Sep 12; and regulations, N. E. Ins. Exchange (full) Dec 26-**90**; rules, England *El Rev* Jan 14-**88**; station ins., Barton, May 31, July 19-**90**; and wiring rules, com. report, Sep 12-**91**; elec. and ins. interests, Alexander *El Wld* Feb 22; stations hazards, Low *Sc Am Sup* Apr 9-**92**; lighting and fire ins. rules, Hartwell *The Eng* Dec 5-**90**

INVENTIONS, of Henry Pinkus, Tanner *El Rev Lond* * Jan 8-22 -**92**; effect of, Brackett *El Rev* Apr 18-**91**; progressive * Jan 2-16-**92**

INVESTMENTS in country districts, Black *El Wld* Aug 20-**92**

IRRIGATION, Collins *El Eng* * Apr 16-**90**

KIRCHOFF'S laws and applic., Rimington (full) *El Rev Lond* * Mar 2-30 * Apr 6, 13-**88**

KITE, Franklin's expt., McAddie *El Rev* * Aug 22-**91**, *El Wld* Sep 24-**92**

LABORATORY, Hopkins *Sc Am Sup* * Mar 21-**91**

LAMP posts, Berlin *E News* * June 16-**88**

LAMPS, and wire cals. without tables or curves, Roberts *El Eng* Aug 3-**92**; max. effic., Howell *El Rev Lond* June 29-**88**. See also under ELEC. Co's, Edison, etc. — Lighting

Electric LAMPS, ARC, and mechanism, S. P. Thompson (very full) *El Eng* May * July - Sep, *El Rev Lond* * Mar 15-29 * Apr 12, 19, *El Rev* Apr 13, (full) *Sc Am Sup* * Apr 20, 27-, **89**; effic., Nakano *El Eng* * July, *El Rev Lond* * Sep 6, (full) *El Wld* * June 1-**89**; Brush double carbon, legal decis. *El Wld* Jan 4, do. *El Rev* Jan 4; universal * Oct 11-**90**; cost of lighting (various Am. cities, 38) Mar 26; the Riedel * Apr 9-**92**; manuf. for low tension circuits *El Wld* *Apr 30-**92**; Saundersons * June 7-**90**, *El Eng Lond;* light of *Eng* May 6; the Crompton-Crabb * June 24-**92**; and incand., probs. in the physics of, Fleming *Sc Am Sup* * Aug 23-**90**

CARBONS, properties of, Best (full) *El Eng* * Aug -**88**; Fisk, July 27-**92**; life and effic., Marks (full) * May 28, *El Rev Lond* Aug 8, (full) *El Rev* * May 31-**90**; tests, Peck, Feb 22, *El Wld* Feb 22, Law, 22, life and effic., Marks (very full) * May 31-**90**; different forms, Warner, Sep 19-**91**; Fisk, July 23; Nutting's carbon feeding * 30-**92**

GLOW-lamps, pats., ed. *Eng* July 20-**88**; max. effic., Howell, abs. *Inst C E* v 93 -**88**, *El Eng* v 7 -**88**. See also ELEC lamps, incand.

INCANDESCENT, max. effic. of, Howell, discuss. *Am Inst Elec Engrs* May -**88**, (full) *El Eng* * May -**88**; relation between initial and average effic., Peirce * July; filaments form and effic., Reed, Dec -**89**; data and testing, Puffer (full) * Jan * Feb * Apr 2; Jenks' air space cut out * June 11-**90**; rating candle power of, Bell, Feb 25; the Beacon vac. pump for exhausting * Mar 4; wiring rules and formulas, Hering * Apr 1, 8, Loomis 15, Pike 29; highest econ. in, Leonard 15; Grier 22; econ., Weaver, June 3; Edison vs. U. S. Co. Dec 16-**91**; commercial rating of, Wirt * June 22; life and effic. test of, Thomas, July 13; life of, relative to mercury and metallic vac. pumps * Dec 14-**92**

El Rev Lond 'flashing' carbon filaments at different temps., Powell, May 4-25; effic. with direct and alt. curs., Ayrton, Perry, June 1; sectional testing of filaments, Powell, Oct 5-**88**; form and effic. of fils., Reed, Dec 20, 27; heating of, Ram, 6 * 13-**89**; highest econ. of, Leonard, Apr 24; Grier, May 8, econ., Russell, 8, 15-**91**; Edison pat. Am. decis. Oct 21-**92**

El Rev highest econ., Leonard, Apr 18; Grier, May 2:

Electric LAMPS,

blackening of, Powell, July 18-**91**; life and effic. test, Thomas (full) * July 16; Westinghouse new (non-infringing) * Oct 22 -**92**

El Wld max. effic., Howell * Apr 14, 28; (wiring) leads, table, July 14-**88**; relation between initial and av. effic., Peirce (full) * June 8; fits. from and effic., Reed * Nov 30, shape and size do. discuss., Dec 14-**89**; Berrenberg's vac. pump * Apr 26; life of, table, May 3; Edison special, Jackson, Sep 27-**90**; highest econ., Leonard, Apr 18; Grier, 25-**91**; Ries' regulating socket * Mar 19; curves and wire cals. without tables, Roberts * July 2; life and effic. test, Thomas (full) * 16, do. Gossler (full) * Sep 17; age-coating in, Nichols * Nov 12; pats., separable or detachable, Böhm * Dec 3; advantages of forcing at expiration of their life, Hering * 24; life and effic. tests, Feldmann * 17-**92**, *Electric Lond*

Eng glow lamp pats., ed. July 20-**88**; deterioration of, ed. Jan 23-**91**; glow lamps, max. effic. Howell, abs. *Inst C E* v 93 -**88**, *El Eng;* and arc, probs. in the physics of, Fleming *Sc Am Sup* * Aug 23-**90**; data and testing, Puffer (full) *Tech Q* * Feb, insets * May -**90**; candle power relative to voltage, Ferguson, insets * July -**91**

PORTABLE, Friedlander's *The Eng* June 1-**88**

LAUNCHES, Reckenzaun (full) *El Eng* Aug 13-**90**; on the Thames river, Forbes *El Wld* Oct 5-**89**; *E News* Aug 23-**90**. See also LAUNCHES

LIGHT, car, Penn. R., inset *E News* * Aug 23-**90**; and power long dist. transmission, Scott *El Eng* * June 15; lights, photometric study of, Genung *El Rev Lond* * Dec 16 *El Wld* * May 28-**92**; signals, Conz incand. system *The Eng* July 6-**88**. See also ELEC. Lighting

LIGHTING, from financial standpoint, Wiman *Cassier's* Apr -**92**; dangers, Edison *El Eng* Dec -**89**, Jan -**90**; in railroad service, Leonard, July 9, do. *E News* July 12-**90**

El Rev Lond Fontaine, Sep 27-**89**; standard specs. July 4; sanitary aspects, Preece, Aug 29; in its relation to the consumer, Naylor, Dec 5-**90**; mains, Preece, May 22; nine years' record, Bd. of Trade report, Aug 14-**91**; English stats., table, Jan 8; figures, Booth * Apr 1, 8, 22 * May 27, June 17 -**92**

El Rev convention, Pitts. (full) Feb 25-**88**; hazards, Has

Electric LIGHTING

kins, Oct 5-**89**; in the tropics, Fleming, May 31; superior to gas, Hoho, Oct 25-**90**; cost, table, com. rep. Feb 28-**91**

El Wld by storage bats., cost, Oct 18-**90**; data, com. rep., table, Feb 28; prices, July 4; relation to optical science, Boyle (full) * Nov 14-**91**; from finan. standpoint, Wiman, Mar 5; supply cost, Hopkinson, Dec 3, 10, 24; photometric study of, Genung * May 28, do. *El Rev Lond* * Dec 16-**92**

Eng central station, Crompton (cost, etc.) Apr 20-**88**; cost, ed. Nov 11-**92**; artesian well plant *E News* * Sep 29-**88**; cost of, various cities, n Oct 5, 12-**89**, Jan 25; Kansas City, June 28; candle power, Kingman, cor. 28-**90**; Geipel *Inst M E* Feb -**88**; and working, Preece *Sc Am Sup* June 2, 23; in Am., Forbes (full) Oct 27-**88**; Fontaine report, Nov 16-**89**; cost *The Eng* Mar 11-**92**

ACCESSORIES, English and Am. differences, Bathurst *El Wld* July 26-**90**

ANNAPOLIS, Md. station *El Wld* * July 27-**89**

APPARATUS, rules for *E Rec* Aug 16-**90**

ARC, Westinghouse alt. system *El Eng* * Apr 2; cost, various towns and cities, Rosewater, 9-**90**; use of arc in, E. Thomson (full) * Feb 25; rates, various cities, Apr 1-**91**, cost do. *El Rev Lond* Dec 13-**89**; E. Thomson, Mar 20 * 27, Apr 3 -**91**; cost from small power stations, Sep 30-**92**; cost various (38) Am. cities, table *El Rev* Mar 26-**92**; the Huntington arc projector *El Wld* * Dec 7-**89**; station, St. Louis (largest in world) report (full) Jan 3; use of arc in, E. Thomson (full) * Feb 28; 'Munic.' St. Louis system, Ayer, Sep 19-**91**; Westinghouse system, abs. *Inst C E* v 101 -**90** * *El Eng N. Y.* -**90**; cost, various cities *Sc Am Sup* Dec 14-**89**

ASHTON Court station, England *The Eng* * Dec 11, 11-**91**

ASSOC., Nat. pro. (full) *El Eng* Sep -**88**, Sep -**89**, (full) Mar, Mar, Aug 27-**90**, Feb 25, Montreal (full) Sep 16-**91**, Huntley addr. Mar 2-**92**, (full) *El Rev* Sep 8-**88**, (full) Mar 2, Niag. Falls, Aug 17-**89**, (full) Feb 22, Aug 30-**90**, (very full) Feb 28, Montreal, pors. * Sep 5, 19-**91**, pors. * Feb 20, (full) Mar 5-**92**, (full) *El Wld* Mar 3, Sep 8-**88**, (full) Mar 2, Aug 17-**89**, Kansas C. (very full) Feb 22, pors. * Aug 30-**90**, Pres. addr. (full) Feb 28, Montreal (very full) Sep 5-19-**91**, general hist. review, pors. (full) * Feb 27, Mar 5-**92**, *Sci Am* Mar 9-**89**, Prov. *St R J* Mar -**91**

Electric LIGHTING, BALL system *Sci Am* Feb 9-**89**
BANGOR, Me., Brush munic. plant *El Wld* June 29-**89**
BERLIN *El Rev Lond* July 19, 26-**89**; Kaiser gallerie *The Eng* Sep 21-**88**
BOSTON, Edison station (full) *El Eng* * Aug 10-**92**
BRADFORD, map *El Rev Lond* * June 10-**92**
BRIGHTON, Crompton report *El Rev Lond* Mar 7-**90**
BROOKLINE Gas Light Co., Mass., station *El Eng* * Mar 16-**92**
BROOKLYN, N. Y., Edison station, development, Field *El Eng* * Mar, *El Rev* * Mar 1, *El Wld* * Feb 22-**90**, (full) * Dec 21-**89**
BRUSH-Swan station effic. test, Bedell *El Wld* Sep 10-**92**
BUOYS, N. Y. harbor (cables) *El Rev* * Mar 12-**92**
CAMBRIDGE, England, station (full) *Eng* * Nov 4-**92**
CANCE system *Eng* July 19-**89**
CHELSEA, England, distrib. with accums., Webber (full) *El Rev Lond* * Oct 4-**89**
CHICAGO, Ill., Wash. Park, Scheffler *El Eng* * Nov 30-**92**; *Eng* * June 19-**91**
CINCINNATI, O., Hickenlooper station (working plan and el.) *El Wld* * Aug 24-**89**
CLINTON, Mass. station *El Eng* * May 20-**91**
CONDENSERS, future of, Swinburne *El Eng* * Jan 6; spark and air jet expts., E. Thomson * Feb 24-**92**. See also ELEC. condensers
DEPTFORD, Ferranti mains *El Eng* * July 9-**90**; alt. system *El Wld* * Dec 8-**88**
DOMESTIC, O'Keenan primary applic. to, Shedlock *El Wld* * July 7-**88**; plant test, Segundo, July 12-**90**, *Industries*. See also ELEC. Lamps, incand. — lighting, incand.
DUBLIN station *El Rev Lond* * Sep 16-**92**; *The Eng* Oct 2 -**91**
EASTON system *El Wld* * Nov 30-**89**
EDISON, pat. suit in England (full) *El Eng* June- Sep -**88**; station test, Hill (full) *El Rev Lond* Dec 21, 28-**88**; and Swan United Co. report, Aug 2-**89**, Aug 1-**90**, July 22; feeder and main pat. hearing, Aug 5-**92**; Edison Illum. Co's pro. *El Rev* Aug 24, *El Wld* Aug 24; Canada decis. (full) Mar 23-**89**; and Swan pats., legal decis. *The Eng* Dec 21-**88**; three-wire central station system * Nov 15, 22-**89**. See also ELEC. Co's, Edison; ELEC. lamps, incand, etc.

Electric LIGHTING, EIFFEL tower plant *Eng* * June 21, (full) *Sc Am Sup* * July 27-**89**

EMS, Imhoff, abs. *Inst C E* v 92 -**88**, *Central Elek* -**87**

ENGINES, high and low speed, Powers *El Eng* * July -**88**; Edison direct connected trip-expan. and generator * Apr 29-**91**; high speed in, Thurston *El Rev Lond* Aug 29, *El Wld* Aug 9-**90**; independent engines for incand. stations, Church * Mar 3, *El Rev* Feb 25-**88**; 1000 h.p., Berlin, inset *The Eng* * Apr 11, 11-**90**. See also ELEC. light stations; ENGINES

FERRANTI system, Haskins *El Eng* Feb 25, *El Wld* Feb 28 -**91**

FRANKFORT-on-Main *El Rev Lond* Feb 28 * Mar 7-21-**90**; exhib. May 29-**91**; report, abs. *Inst C E* v 100 -**90**, *Elek Zeit* v 5 -**90**; station, Miller report *The Eng* * Sep 30-**92**

GENEVA, Chavannes, abs. *Inst C E* v 95 -**89**, *Lum Elec* v 29 -**88**

HANOVER, Kohlrausch, report, abs. *Inst C E* v 100 -**90**, *Elek Zeit* v 5 -**90**

INCANDESCENT stations, independent engines for, Church *El Rev Lond* * Apr 13-**88**; prog. Böhm * Oct 9, 16, (full) *El Wld* * Sep 12-**91**; Ottawa, Ill. Valley plant, long dist., map *E News* * Oct 5-**89**; carbon filaments, Fitz-Gerald, n *The Eng* May 18-**88**; Adelphi theatre plant, Edison-Swan Co. * Jan 25-**89**. See also ELEC. lighting, London, etc. — stations

KESWICK water-power station, Fawcus *Eng* May 30, and discuss., inset *Inst C E* * v 102 -**90**

LIVERPOOL stations *El Rev Lond* Jan 30-**91**; license *E Rec* Sep 22, Oct 13, 27-**88**

LONDON *El Rev Lond* May, June 14, schemes, July, Aug -**89**; prog., Bailey (full) Dec 19-**90**; Elec. Supply Corp. report, Apr 1-**92**; prog., Bailey *El Wld* Jan 10-**91**; ed. *Eng* May 24-**89**; Pruden. Assur. Co. offices station * Feb 14-**90**; Naval exhib. * Nov 27 * Dec 11-25-**91** * Jan 1, 8-**92**; Lond. Supply Corp., Deptford *E & Min* Nov 10-**88**; *E News* July 4-**91**; Lond. Cen. station, Gilley *Soc Arts Mass* -**90**

The Eng Deptford incand. station, Lond. Elec. Supply Co. Oct 26-**88** * Apr 5, 12 * May 31; Kensington incand. station. House to House Elec. Sup. Co. * Feb 8-**89**; * Sep 5, 12 * Oct 24 * Nov 7 * Dec 5, 12, 26-**90**; Met. Sup. Co., map * Jan 16, 16 * 23 * Mar 6, Scotland Yard * May 8-**91**; St.

Electric LIGHTING, London
Pancras station, Regent's Park * Feb 19, 26; Notting Hill * Apr 15; Westminster Sup. Co. * May 13; * Sep 9-**92**
LOOMIS system *E News* * May 18-**89**
LOWELL light and power station, Shaw *El Eng* * Jan 14-**91**
MASSACHUSETTS statistics *El Wld* Mar 26-**92**
MELBOURNE exhibition, Murray *El Rev Lond* Nov 15-**89**
MOLDINGS, inset *El Eng* * Sep 10-**90**
MOTORS, trials *El Rev Lond* Feb 22, report *Eng* * Feb 22 * Mar 1-15, *F Inst* May -**89**, *J Soc Arts*
MUNICIPAL, Francisco *El Rev* Aug 30, *El Wld* Aug 30-**90**; Bangor, Me., plant, Brush, June 29-**89**; St. Louis 'Munic.' arc system, Ayer (full) Sep 19; by munic. authorities, H. Robinson *E News* Sep 12-**91**
NATICK, Mass., station *El Eng* * Aug 6-**90**
NEWCASTLE-on-Tyne Elec. Sup. Co. station, Heaviside *El Rev Lond* Oct 28-**92**
NEW York City, Edison 26th st. station, (full) *El Wld* * Jan 19-**89**; Madison Sq. Garden, Sullivan * Nov 14-**91**; * Jan 2-**92**
OXFORD station (full) *El Rev Lond* * July 8, *The Eng* * July 1-**92**
PARIS, exhib. '89 *El Rev Lond* Mar 29-**89**, Mar 21, 28, Apr 4, May 16, 23, 30-**90**; Sector of Place Clichy works * May * June 5-**91**; exhib., Heister system *El Wld* * Aug 24-**89**
Eng Palais Royal Edison station * Mar 8; exhib. * May 3, portable military plant, July 19, Oerlikon plant, 26, * Nov 15, 22-**89**
Inst C E Paris markets, Andra, abs. v 100 -**90**, *Genie Civil* * v 16 -**89**; station, Meyer, abs. *Inst C E* v 105 -**91**, *An Ponts* v 12 -**90**; Nansouty, abs. *Inst C E* v 108 -**92**, *Genie Civil* * v 20 -**91**; exhib., Fontaine *Sc Am Sup* * May 25 * Aug 17, Gramme station * Oct 19-**89**; Boul. Rich works, Lenoir * Jan 2-**92**
The Eng Paris exhib. * May 3-31 Oerlikon works * June 14, 21, T-H system * 28, station, July 26, Soc. Gramme do. Sep 20-**89**
PHILADELPHIA, Edison station *El Eng* * Oct 8-**90**, *Pwr* * May -**89**
PORTABLE plant *Eng* * Feb 10-**88**; light port. military, Paris exhib. July 19-**89**, do. Charlesworth *Sci Am* Nov 17-**88**, do. ap., Suez canal *The Eng* Oct 12-**88**

Electric LIGHTING, PROVIDENCE, R. I., Narragansett Co. station *El Eng* * Sep, (full) *El Rev* sup. * Aug 17, Henthorn (full) *El Wld* * Aug 17, *Pwr* * Oct -**89**, *St R J* * Aug -**90**

REGULATIONS, light and power service rules, Columbian exhib. *El Eng* Dec 28-**92**; station, safety *El Rev Lond* Jan 11-**89**; acts 1882 and 1888, Jan 10; (full) Oct 17-**90**; rules for work, Benjamin *El Rev* May 10; and motive power, for install. of, Boston Manuf'rs Mut. Ins. Co. Aug 23, do. *E News* Aug 9; ins. rules, com. report *El Rev* Aug 30, Sep 27, Jenks, 27, N. E. Ins. Exchange, Nov 8-**90**, do. *El Wld* Apr 21-**88**; rules, com. report, Sep 19-**91**; rules, for safe install. *E News* Aug 9-**90**, Oct 3-**91**; rules for *E Rec* Aug 16-**90**. See also ELEC. insurance regs.

ROPE gear for elec. light work, Booth, Lea *El Rev Lond* June 26-**91**

RULES. See ELECTRIC lighting regulations

SAFETY devices E. Thomson *El Eng* Mar, *El Wld* Feb 22-**90**; station safety regs. *El Rev Lond* Jan 11-**89**. See also ELEC. lighting regs.

ST. Brieux *El Wld* * May 16-**91**, *El Rev Lond*

ST. Catherine's Point light-house, most powerful light in world *Sc Am Sup* * July 21-**88**, *The Eng*

ST. Louis 'Munic.' arc system and station (largest in world) *El Rev Lond* Jan 16, report (full) *El Wld* Jan 3, Ayer (full) Sep 19-**91**

ST. Paul Gas Co. station *El Wld* * Feb 23-**89**

SALEM, Mass., T-H station *El Rev* * June 15, (plans) *El Wld* * June 15-**89** * Mar 15-**90** * Feb 14-**91**

SOPHIA City *El Rev Lond* June 17-**92**

SPERRY system *El Wld* * June 15-**89**

SPOKANE Falls station *El Wld* * Sep 13-**90**

STATIONS *Am C E* Edison incand., test of, Hill, and discuss. v 18 -**88**; *Cassier's* speed reg. of engines, Aldrich, May -**92** *El Eng* incand., independent engines for, Church, Mar -**88**; stats., U. S. Aug 20; value of detail in, DeCamp * 27-**90**; distrib. of steam from, Prentiss * Feb 25; central, management and finance, Foster, Apr 22, 29, May 6-20, June 3-24, July; op. by water power, Redman, Sep 16-**91**; fly-wheel accidents, Emery, Feb 10, 17; effic. and higher econ., Vail, Nov 23, 30, Dec 7; light and railroad plants op. from same station, M Cay, Dec 28-**92**

Electric LIGHTING STATIONS

El Rev Lond independent engines for, Church * Apr 13; transformers vs. accums., Crompton * Apr 20, 27, May 4; breakdowns, R. J. Jones * June 22; cost, Fritsche * Aug 31-**88**; cen., notes, Yeaman, Nov 21-**90**; materials * Mar 13; combining contin. and alt. cur. systems, Leonard, Oct 2, 9; how to get paying loads for, Marks, Dec 4-**91**

El Rev construction, Woodbury * Feb 22; econom. steam gen., Babcock, Mar 1; accounts system, T. C. Smith, Mar 1; insurance, Barton, May 31, July 19-**90**; building, Berlin Iron Bridge Co. * Jan 10; steam distrib. from, Prentiss, Feb 28; accounts, uniformity in method, Burleigh, sup. Sep 19; cen., op. by water power, Redman, 19; how to get paying loads for, Marks, Nov 21-**91**; and power, Mackie, July 23, 30, Aug 13, 20, Sep 10-24, Oct 8, Nov 5, 12-**92**

El Wld accounts, T. C. Smith, Feb 22: Woodbury * 22; value of details in, DeCamp, Aug 30; as an investment, Sunny, Oct 25-**90**; steam distrib. from, Prentiss * Feb 28; uniformity in accounts, Burleigh, Sep 19; op. by water power, Redman, 19; how to get paying loads for, Marks, Nov 21-**91**; the lamp, manager and customer, Roberts * Mar 19: load curves * Feb 27-**92**, * *Electrician Lond*

E News Keswick, England, water power, inset * Sep 13-**90**; op. by water power *E Rec* Oct 10-**91**; running *Pwr* * Sep - Dec -**90** * Jan - Mar * Sep * Nov -**91**; hazards, Low *Sc Am Sup* Apr 9-**92**; stats. *St R J* Sep -**90**; Soc. L'Eclairage Elec., France *The Eng* * Nov 1-**89**; U. S., Addenbrooke, Jan 10, 24, 31-**90**; arc station management, June 24-**92**. See also ELEC. lighting, names of places

SUEZ canal, Sellon *El Rev Lond* * Sep 14-**88**

TAMWORTH, New So. Wales, Dymond *Inst C E* * v 108 -**92**

TESLA's system with curs. of high frequency *El Rev Lond* * July 17, *El Rev* * July 4-**91**

TIVOLI station *El Rev Lond* * July 15-**92**

TOPEKA, Kan., Kingman, discuss. *Am C E* v 26 -**92**

VENICE station *Eng* * Aug 14-**91**

WASHINGTON, U. S. Navy Yard, Brush arc station, Wilkes *El Eng* * May 21-**90**

WESTINGHOUSE alt. arc system *El Eng* * Apr 2-**90**; (full) *El Rev* and sup. * Oct 27, alt. stations (list) Nov 10-**88**; *Eng* * Feb 8, 22 * Mar 15-**89**; abs. *Inst C E* v 101 -**90**

Electric LIGHTING, WESTMINSTER Elec. Light Co. station *El Rev Lond* * Mar 18-**92**
WIRING leads cal., graphic method, Hering *El Eng* * May 27 -**91**. See also ELEC. wires
WORCESTER, Mass. station, Shaw *El Eng* * Dec 10-**90**
LOAD equalizer, Mailloux *El Rev Lond* * Dec 26-**90**
LOCK, electro-mag. permutation, Sedgwick's *El Rev* * Sep 28 -**89**
LOCOMOTION, Edison pat. *El Rev* * Oct 4-**90**
LOCOMOTIVES, Dobbie's gearless *El Eng* * June 10; Eickemeyer's gearless *El Rev* * June 13-**91**; proposed, Pellissier *El Wld* * Aug 6; tests, Siemens * 27-**92**; ed. *The Eng* June 13-**90**
LOG *El Rev Lond* * Jan 30-**91**
MACHINES, Wimhurst influence, Darke, cor. *Eng* * Feb 14-**90**, theory, Pellissier *Sc Am Sup* * Nov 14-**91**. See also ELEC. influence machine; DYNAMOS; ELEC. motors
MAGNETIC susceptibilities of various iron and steel, Niegbaur *El Eng* * Feb -**90**; reluctance, Kennelly (full) * Nov 4-**91**; propagation, E. Thomson, Wightmann *El Rev Lond* * Oct 26, do. *El Wld* * Oct 27-**88**; screening, variational, W. Thomson * May 9, do. *El Rev Lond* May 1-**91**; leakage. Ives * Jan 22, 29; balance, Du Bois * Sep 2, do. *El Wld* * Sep 24-**92**; non-magnetic balances and alloys, Haswell, Webb *El Rev* June 23 -**88**; field, change of form affecting, Dolbear, Mar 21-**91**; permeabilities of irohs, Thompson * July 2-**92**; call and integraph, the Abdank *El Wld* * Nov 24-**88**; Eickemeyer's gauge * Nov 9-**89**; mag. circuit notes, Steinmetz, June 4; permeabil. of special irons, M. E. Thompson * 25; viscosity expts., Hopkinson * Oct 1-**92**; field, early conception, Houston *F Inst* Mar -**92**; circuit, theory, Collins *Tech Q* * May -**89**
MAGNETO-motive force and mag. formulas, Emery (full) *El Rev* * Aug 27 * Sep 3-**92**
MAGNETS, permanent, character of steel used for, Preece (full) *El Rev Lond* * Sep 12-**90**
MAGNETISM, relation to induced elec. mo. force and cur., E. Thomson (full) *El Wld* * June 1, *El Eng* * June -**89**; Hopkinson * Apr 9-30-**90**; twisting, Balch * Sep 14-**92**; in watches, Giles *El Rev Lond* * Oct 26, Gribi *El Rev* June 9, (full) *El Wld* * June 30-**88**; induced, Ewing * Oct 4, 11, *El Rev Lond* * Oct 3-**90**. See also MAGNETISM

Electric MAGNETIZATION, permeabil. of iron at right angles to direction of, Kennelly *El Eng* * June 11, 18-**90**; curves for, Emery * Dec 28-**92**; of iron, time-lag in, Ewing (full) *El Rev Lond* * Nov 8-**89**; changes produced by, in length of iron wires, Bidwell, Oct 14; of iron, electro-chem. effects, Andrews * Nov 25-**92**; formulas, Emery (full) *El Rev* * Aug 27 * Sep 3-**92**; of iron in very strong fields, Ewing *El Wld* Dec 22-**88**; curves of iron, under alt. curs., Moore * June 4-**92**; theory and formula for soft iron, Collins *Tech Q* * May -**89**

MEASUREMENTS, W. Thomson's instrums., Fleming *El Wld* * Feb 25, *El Eng* * May -**88**, by Weston high resist. voltmeter, Loomis * Dec 24-**90**, *El Rev Lond* * Jan 9-**91**; measuring ap. standardizing, Berlin, Aug 9-**89**; Anthony *El Rev* Jan 21; methods, Liebig, sup. Sep 8-**88**; wiping contact methods for cur. and poten., Thomas * July 30, *El Wld* * July 2-**92**; voltametric of alt. curs., Kennelly * Nov 3; in a house to house supply, Lowrie * 17-**88**; units and measures, Internat. conference, Paris (full) Sep 21-**89**; applics. of Weston voltmeters and ammeters, Maschke (full) * Mar 26 * Apr 2-23-**92**; Lowrie *Eng* Oct 5-**88**; Webb *E Mag* Oct; instrums., Swinburne *E News* Sep 15-29, (full) *Inst C E* * v 110-**92**, *The Eng* * May 6-**92**; as applied to commercial work, Anthony *F Inst* Jan -**88**; constant shunt method for large contin. curs., Pike * June -**92**; resist., Bauer *Pwr* * Mar -**92**

METERS *El Eng* Shallenberger's * Sep -**88**; Edison chem., Jenks (very full) * Jan -**89**; the Walker * Apr 9; Wood's * Dec 17-**90**; the Meylan-Rechniewski energy * Mar 18, Eickemeyer's differential magnetometer, Steinmetz * 25; alt. cur. potentiometer, Moler * May 27-**91**; Pilkington-White * Apr 13 -**92**

El Rev Lond Geyer-Bristol, for direct and alt. curs. * Dec 21, 28-**88**; Edison chem., Jenks, Jan 11 * 25, Feb 1, 8; for central stations, Forbes, Feb 1, 8; Cardew recording * Nov 15-**89**; com. report, Mar 28; Blathy alt. cur. * June 20; Thomson's * Aug 15; W. Thomson's * Oct 10; Mares' energy * Nov 7; Shand, Dec 5-**90**; Meylan-Rich. energy * Feb 13; Ferranti's * Mar 20; Frere's * 20-**91**; Brillie energy * Apr 29; Scott's * Dec 16, *The Eng* * Dec 16-**92**

El Rev for central stations, Forbes, Feb 16; the Slattery * Oct 12-**89**; Edison electrolytic, Kennelly * Oct 4-**90**; Walker, May 30, discuss. June 13-**91**

Electric METERS

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Inst C E for recording consumpt. of elec. energy, Wordingham, insets (full) * v 108-**92**; Mares' energy, Juppout, abs. v 103 -**91**. *Genie Civil* * 17-**90**; Hobart *Pwr* * June-Sep -**89**; the Wood ammeter *Sc Am Sup* * Jan 14-**88**; radiation meter, Gregory * Dec 14-**89**; * Jan 25-**90**; the Frager *The Eng* * May 29; the Teague * June 19-**91**. See also ELEC. ammeters—ohm — secoh — tele — volt — watt meters

MINING machinery, Atkinson *Eng* Feb 13, *E News* * Aug 8; energy transmiss., Leonard and ed. * May 16, Edison elec. percussion drill, 16; Aspen Min. & Smelting Co. * Oct 10-**91**

MOLDINGS, standard for elec. work *El Rev* * Nov 15-**90**

MOTIVE force, thermo-chem. relation to, Siebel *El Eng* July 9-**90**, relations to atomic wt., chem. heat, etc., Gore, *El Rev Lond* June 12-**91**, general relation to equiv. vol., Gore, June 3-24-**92**, constant with variable speed, Hoho *El Wld* * Jan 25-**90**, equation, for resist. and self-induc. circuit, Bedell (full) May 14-28, June 4-**92**; properties of the human heart, Waller * Nov 3, *Sc Am Sup* * Nov 24-**88**, *El Rev*; power, Thorenberg plant *Sci Am* Dec 1-**88**

MOTORS, *Am C E* comparative tests and st. locom., Manhattan eleva. R., Moss, and discuss., insets * v 23 -**90**

El Eng alt. cur., Duncan (full) * Mar, Mar; Liebig, Mar; designing, Walker, May; 2 h.p. Sprague, expts., Cox * June * Aug; alt. cur. and transformers, new system, Tesla (full) * June, June, Swinburne, Sep; service charges basis, Lufkin, Sep -**88**

El Eng diags., Clarke * Jan; regulation, Crocker * June; and dynamos, Perret * Aug; speed regulation, Deprez on, Paget * Aug; alt. cur. evolution, Patten * Oct -**89**

El Eng Swinburne's alt. cur. * Apr 16; Tesla's alt. * Aug 6; rates basis, Lufkin * 27; Tesla's new alt. Sep. 24; building, Short elec R. system * Oct 15; Bradley's alt. * Nov. 5, self-exciting * 12; windings, Serrell, Dec 10; Riker low speed multipolar contin. cur. * 17-**90**

Electric MOTORS

El Eng inventors of (Thomas Davenport) Pope (full) * Jan 7-28 * Feb 4; Patten's alt. * Mar 4 * May 13; alt. cur. design, Weston * Apr 1; perfection of stationary, Crocker * May 27; alt. cur., Hospitalier, Aug 26; op. at any speed or torque, with max effic., Leonard * Nov 25; law of max. effic., Mailloux, Dec 9; polyphasal generators, Pupin * 23-**91**

El Eng the Perret (full) * Jan 6; law of effic., Mailloux, Jan 13; alt. cur., Stanley * Mar 2; gearless, Short * Apr 13; Excelsior, Muldaur * Sep 14; Lundell fan * Dec 7-**92**

El Rev Lond simple * Apr 13; alt. cur., Tesla's new system * June 15, ed. 22 * 22-**88**; design, Snell, Feb 1; speed reg., Deprez, Apr 26, *Compt r;* regulation, Crocker *El Rev Lond* * June 14; alt. cur., evolution of new type, Patten (full) * Oct 11-**89**; armature reactions, theory, Swinburne * Feb 14, 21, Mar 28, Apr 4; op. with high tension curs., Sperry * Feb 21, 28; design, Esson * 28 * Mar 7, 14; Tesla's alt. * Aug 22, Oct 3-**90**; alt. cur. design, Weston * Apr 17; Hutin & Leblanc's alt. cur. * July 24; Edison's * Aug 21-**91**; leakage, Ives * Jan 22, 29-**92**

El Rev Liebig, Feb 25; alt. cur. and transformers, new system, Tesla * June 2, 9, Weyde * July 14; service charges basis, Lufkin, Sep 22-**88**; Bradley alt. cur. imps. * June 22; alt. cur. Patten * Sep 28-**89**; armature reactions, theory, Swinburne * Mar 15; imps. do. * Apr 19; Tesla's alt. cur. pats. * Aug 16; rates basis, Lufkin * 30-**90**; Eikemeyer's novel * Mar 28; Edison small slow speed * May 30; the perfection of stationary, Crocker * June 6; alt. cur., Hospitalier, Sep 12; Bradley's alt. cur. * Oct 2; perfect, Everett, 31; aut. op. at any speed or torque, Leonard * Nov 28-**91**; alt. cur., Stanley * Mar 12; Ryan series reg. test, Bliss, Dec 31-**92**, *Sib J Eng*

El Wld the Patten * Jan 7; effic. tests, Crane * Feb 4; alt. cur., Duncan (full) * 25; Liebig, Mar 3; reg., priority of invention, Sprague * Apr 7, 14; cal. and designing, Crocker * 28; alt. cur. and transformers, new system, Tesla * June 2; the Lugo * July 14; service charges, basis for cal., Lufkin * Sep 8; designing, Owens * Nov 17-**88**

El Wld alt. cur., Tesla, May 25; reg., Crocker (full) * June 1, discuss. * 8; the Perret * Feb 2, July 6 * Aug 3; alt. cur, ev. of new type, Patten (full) * Sep 28; Industries' prize, n * Dec 7; new prin. of constructing, Mailloux * 28-**89**

Electric MOTORS

El Wld relation to elec. lighting Co's. Fitzgerald * Feb 1; op. with high tension curs., Sperry, 15; design, Esson (full) * Mar 22, 29 * Apr 5, 12; the Zipernowsky-Deri-Blathy synchronous * Mar 29; Perret multipolar * July 26; alt. cur., new types * Aug 16; Van Depoele induction * 16; rates basis, Lufkin, diags. * 30-**90**

El Wld work of Dow, in torpedo service, Apr 18; alt. cur., Duncan * May 9, 16; perfection of stationary, Crocker * May 30, discuss. June 6; alt. cur., Hospitalier * Aug 29; Frankfort-Lauffen three-phase, Hering (full) * Oct 31 * Nov 7; aut. op. at any speed or torque, with max effic., Leonard * Nov 28-**91**

El Wld magnetic leakage, Ives (full) * Jan 2; alt. cur., Stanley (full) * Mar 5; alt. cur. self-starting and exciting synchronous, Patten * Apr 2; cal; Bedell, diag. * 30-**92**

Eng alt. cur., ed. Nov 20; the Short gearless *E News* * Sep 5-**91**; in workshops, Jenkin *Inst C E* * v 102-**90**; small, effic., Clifford, abs. v 91-**88**, *Am Acad Arts & Sci* v 22-**87**; *E Rec* * Nov-**90**; cal., Bedell, inset *F Inst* * June-**92**

Pwr the Baxter * Dec-**88**; Thomson's * Jan; reciprocating * Feb-**89**; Simple * Jan-**90**; (various) * Jan-**92**, *Elec Industries;* (growth of business) Pope *R & Eng* Sep-**89**

Sc Am Sup the Menges thermo-mag, generator * Feb 18; simple, making, Hopkins * Apr 14; charges, basis for cal., Lufkin, Sep 22, Nov 3-**88**; the Tesla * Apr 6-**89**; home made, Parkhurst * Aug 2-**90**; small, Hopkins * Jan 3-**91**

St R J building, Short R. Co. * Oct-**90**; max. effic. conditions, Leonard, Mailloux, Jan-**92**; small, effic., Clifford *Tech Q* Sep-**87**, Feb **89**; small, comparative working expenses of, Korte *The Eng* Jan 22-**92**, *Zeit deut Ing*-**91**. See also DYNAMOS; ELEC. generators; RAILROADS, elec. motors

NAVIGATION, Bennett, *El Rev Lond* Apr 10-**91**.

OHM'S law, extension of elec. mo. force and Oudin *El Eng* Dec 30-**91**; expt. proof, Mayer * July 9, *El Rev Lond* Aug 1-**90**; units, the volt, ohm and ampere, Nipher * Apr 27, ohm det., Wuilleumier, July 13-**88**, suggestions, J. V. Jones (full) Sep 12; the Evershed *El Wld* * Jan 11-**90**; alt. cur., Swinburne * Dec 19-**91**; units, ohm, Glazebrook, Jones *Eng* Sep 26-**90**, new det. of *Sc Am Sup* * Feb 16-**89**; law and electro-therapeutics, Winton, July 26, expt. proof, Mayer * Aug 2-**90**, *Am J Sci.* See also ELEC. units

Electric OMNIBUS, London *Sc Am Sup* * Mar 2-**89**, *El Eng*
ORE-dressing, Tilly Foster mine, McDowell *E News* Oct 4-**90**
ORGAN, control, Hope-Jones *El Rev Lond* Jan 15-**92**; Wacker's action *El Wld* * Nov 23-**89**; organs, Swinburne * July 4-**91**
OSCILLATIONS, Hertz's researches, Tunzelmann *El Eng* Feb * Apr, May * July * Aug, Joubert * Oct -**89**; in air, Trowbridge *El Rev Lond* Oct 17, (full) *El Rev* * Dec 6-**90**
PARCEL exchange system, Bennett *El Rev Lond* * Sep 4, *Eng* * Sep 25-**91**
PATENTS, U. S. stats., Lockwood *El Eng* Feb -**88**; see *El Rev* files, especially 1890, progressive * Mar 26 * Apr 16 * June 4-**92**
PIPE bending *El Wld* * June 18-**92**
POLYPHONE, Zigang's *Sc Am Sup* * Oct 12-**89**
PORTELECTRIC Co's transport. system, N. E. *El Eng* * May 27, Pope report *El Rev Lond* June 5 *El Rev* * May 30-**91**, do. *El Wld* May 23-**91**, carrier * Oct 10-**90**
POTENTIAL, high, phenomena, Skinner *El Wld* * May 7; differences, Negbaur, Nov. 26, Dec 3. 10-**92**
POWER, elec. motor and st. locom. test, Manhat. eleva. R., Moss., insets *Am C E* * v 23 -**90**; distrib., Spaulding, insets *Cassier's* * Dec -**91**; and steam, Wright, Aug -**92**
El Eng standards of econ. in gen. of, Swetland * Aug 27-**90**; comparative cost, effic. of large and small motors, Wheeler, Apr 29; econom. limits of large units, Church * Dec 2, 9-**91**; Edison works, Schenectady, N. Y., Martin (full) * Feb 3; plant at Chic. World's fair, Collins * Mar 23-**92**; distrib. by alt. curs., Tobey *El Rev Lond* * Feb 5; distrib. by direct curs., Dow, 26-**92**; rates *El Rev* Aug 1-**91**
El Wld measurement by voltmeter, Swinburne * Apr 18; measurement of any elec. cur. to any circuit, Ayrton, Sumpner * May 2, 23; measurement developed by alt. curs. in any circuit, Hering * Dec 26; distrib. by alt. curs., Stanley * June 13-**91**, Leblanc *Lum Elec*
El Wld distrib. by direct curs., Dow, Feb 6; by alt. curs., Stanley, 6; Thomson's law of economy, Carter, July 30; station distrib., Unwin, Aug 20, 27; supply cost, Hopkinson, Dec 3, 10, 24; gen. at coal-fields and transmiss. to industrial centers, Thwaite * 31-**92**
Eng econom. limit of large units, Church, Jan 8; altruistic effects, Perrine *E Mag* Jan -**92**; technically considered, W.

Electric POWER

Allen *E News* * Nov 1-**90**; distrib., Spaulding *Pwr* * Dec -**91**, *Am M E*, *Sc Am Sup* Jan 16; gen. in coal-fields, Thwaite *The Eng* Dec 2-**92**. See also ELEC. motors; RAILROADS, elec. power stations

POWER Transmission, *Am Min* present status, Rothwell v 17 -**89**; in mining operations, Spaulding, insets (full) * v 19 -**91**

El Eng (energy) * Feb -**88**, *Industries;* Kapp *El Eng* Mar 25; at very high potens. * Apr 8; Leonard (full) Sep 2-**91**; long dist., Hart * Jan 13; high poten., E. Thomson, Mar 23; long dist., Scott * June 15-**92**

El Rev Lond Sprague, Mar 22 * 29, May 10; long dist., from over compounded gens., Serrell * Dec 6-**89**; Kapp, tables, Feb 20, Mar 6, (full) July 17 * Aug 7-28-**91**; Frankfort plan, Hering, Apr 8; multiphase and distrib., Reckenzaun, Apr 29 * May 13, June 24; long dist., Thwaite, Dec 16-**92**

El Rev Roberts * Aug 31-**89**; Kapp (full) Aug 8; long dist., Frankfort, alt. curs. differing in phase (rotary curs.), Dolivo-Dobrowolsky * Sep 19; Lauffen-Frankfort, Kapp * Oct 10-**91**; long dist., Hart * Jan 16; high poten., E. Thomson, Mar 26; long dist., Scott * June 25; by alt. curs., Kapp * Sep 17; future, Oct 15-**92**, Industries; *Electrician Lond*

El Wld long dist. cals., Serrell, table, May 25; Roberts * Aug 17; long dist., from over-compounded gens., Serrell * Nov 16-**89**; Mar 14; high pressure, at Oerlikon, May * Apr 18; Lauffen-Frankfort plant, Hering (full) * Sep 26 * Oct 31 * Nov 7; by alt. curs., Dolivo-Dob. * Oct 10-**91**

El Wld Lauffen-Frankfort tests, Hering, Jan 9, discuss. (full) Mar 5, effic. * July 2; diags., Schlesinger * Mar 5; Bell, 19; high poten., E. Thomson, 26; multiphase, Reckenzaun, May 21, June 11, July 23; long dist., Scott (full) * June 18; effect of harmonics on alt. cur., Rowland, Dec 10; gen. at the coal-fields and transmiss. to industrial centers, Thwaite * 31-**92**

Eng ed. Feb 20, 27, Mar 6-**91**; cost, Mansfield, n *E & Min* June 23-**88**; Rothwell, Jan 5-**89**; in the west, July 23-**92**, *El Eng;* Nevada mill *E News* Apr 12-**90**; alt. curs. for * Aug 22-**91**; Hering, Mar 19-**92**; Sprague *F Inst* * Mar -**89**; Lauffen-Frankfort, table, Aug; Griffin (full) Sep -**92**; by alt. curs., Stort abs. *Inst C E* v 106 -**91**; cost, Lahmeyer, v 109 -**92**, *Elek Zeit* -**91**-**92**; Geipel *Inst M E* Feb -**88**

Pwr long dist., Hart, Feb, Jackson, Apr, high poten., E.

Electric POWER Transmission
Thomson, May; Griffin * Oct -**92**; Morris *R & Eng* May -**92**; * Oct -**90**, *Genie Civil;* Sprague (full) *Sc Am Sup* * July 20, 27 * Aug 3-**89**; * Mar 3-**88**, *Industries;* long dist., Hart *Tech Q* * Apr -**92**; Kriegstettin to Solothurn, expts. *The Eng* Apr 13-**88**; West, Jan 16; Lauffen-Frankfort install. * Oct 2, 9, oerlikon alternator * 23-**91**. See also RAILROADS, elec. power stations

PROJECTILES, elec. welded, Maxim *Cassier's* * Oct, *El Rev* Aug 6-**92**

PUMPS, pumping in collieries, Brain *El Eng* Jan -**88**; Dittman's vac. *El Wld* * June 4-**92**; Hall's pumping plant *E News* May 5-**88** * Mar 15-**90**; three-cyl. elec., Gould Mf'g Co. * Nov 14 -**91**

RAILROADS, elec. working of, W. E. Hall *E News* July 12, limitations of steam and electricity in transport. 12-**90**. See also RAILROADS, elec.

RECORDING instrums., Holden, Drake and Gorham's *El Rev Lond* * Sep 30-**92**

REGISTER, Ongley *El Rev* * Jan 31-**91**

REGULATORS, Herrick *El Wld* * Apr 5-**90**

RESISTANCE, *El Eng* compensated standards, Nichols * June -**88**; specific, of paper * June; of elec. light installs., Jamieson, Oct -**89**; specific, of metals and alloys, Prescott, Apr 30, May 7; inductive det., Steinmetz, Oct 29, Nov 5-**90**; insul., measuring, Patterson * May 20; of copper, standard for, Holman, Nov 18; compensating, for galv. shunts, Frey * Dec 23-**91**; standards, Willyoung, June 1; insul., of cotton and silk covered wires, Luquee * Dec 28-**92**

El Rev Lond compensated standards, Nichols, Aug 10-**88**; insul., of elec. lighting station, Jamieson, Jan 25; standard, design, Fleming * Feb 1-**89**; of mercury, Glazebrook, Sep 19; spec., of copper, Fitzpatrick (full) 26; of metals, Le Chatelier * Oct 17; wire standard resists. Dec 26-**90**; human body, value of diminished, Cardew, Mar 13; of conductors, measurement, Appleyard * Dec 18-**91**; of pure metals, alloys, Nov 11-**92**; of mercury, det., Glazebrook *El Rev* * Oct 18 -**90**

El Wld compensated standards, Nichols, June **9-88**; of iron and its alloys at high temps. * Apr 19; of mercury, det., Glazebrook, Oct 11; wire standard resists., com. report, Dec 6;

Electric RESISTANCE
coils and boxes, Frey * 20 * 27-**90** * Jan 3, 10; coils, alloys for, Feussner, Mar 14-**91**; non-inductive construction, Ayrton, Mather * Feb 13; of parallel circuits, Bedell * Oct 15-**92**
F Inst Megohm, Davids, Apr -**91**; standards, manuf. and adjustment, Willyoung, Apr -**92**; of metals, steel, Le Chatelier, abs. *Inst C E* v 104 -**91**, *Compt r* v 111 -**90**, 112 -**91**; of pure metals alloys *Sc Am Sup* * Dec 31-**92**. See also under ELEC. insulation
RETARDATION due to iron pipes, Preece *El Wld* May 21-**92**
RHEOSTAT, new, C. E. Carpenter *El Rev* * Nov 5-**92**
ROUTING machine, Irish's *El Wld* * Nov 2-**89**
RULES, fire ins., Hartwell (full) *El Rev Lond* Sep 12-**90**; right hand and other rules, Maycock * Jan 15-**92**; elec. light ins. rules, England *El Rev* Jan 14-**88**. See also ELEC. insurance rules — lighting regs.
SAFETY devices, E. Thomson *El Rev Lond* Mar 14, *El Rev* Feb 22-**90**. See also ELEC. insurance
SCHISEOPHONE (flaws in metals) *El Eng* * July 16-**90**
SCREENING, electrostatic, by gratings, etc., W. Thomson *El Rev Lond* Apr. 17; and magnetic, variational, do. *Sci Am Sup* * May 16-**91**
SEARCH light, Hutchins *Cassier's* * Dec, Knowles (full) *El Eng* * July 27 * Aug 3, 24-**92**
SECOHMETER, Ayrton & Perry's *El Rev* * Apr 20-**89**
SECRET service, individual telegraph call *R Gaz* * Aug 28-**91**
SEEING to a distance, Weiller, cor. *Sc Am Sup* * Feb 8-**90**, *Genie Civil* v 15, *Lum Elec*, *El Rev*
SEWAGE purification, Gilley *Soc Arts Mass* -**90**
SHUNT, constant method, errors in, Puffer *El Rev Lond* May 11-**88**
SIGNAL ap., Morgan's aut. system *El Rev* * June 7, *Eng* * May 16-**90**
SMELTING and production of aluminum, Boby *Sc Am Sup* * July 13-**89**. See also ALUMINUM
SNOW sweeper, General Elec. Co. *Sc Am Sup* * Dec 31-**92**
SOLENOIDS, properties, S. P. Thompson *El Rev* Feb 21-**92**; variable action of two-coil, Aldrich *F Inst* * Apr -**92**
SPARKS, nature, in elec. vibrations of Hertz, Bischoff *El Rev Lond* * Sep 25, Oct 2-**91**; sparking, Serrell *El Wld* * Nov 10-**88**

Electric STANDARDS, com. report *El Rev Lond* Sep 26, Oct 10-**90**; Oct 16, discuss. 30-**91**; Pellet report, Sep 13, 20, *El Wld* Sep 7-**89**; com. report, Sep 26-**91**; Brit. Assoc. Sep 3-**92**; com. report *El Rev* Oct 3-**91**, *The Eng* sup. Dec 9-**92**. See also ELEC units

STOCKS, English, table *El Rev Lond* Dec 16-**92**; market *El Wld* Dec 6-27-**90**

STORAGE, of the alt. cur., Foppl, abs. *Inst C E* v 102 -**90** * *Elek Zeit* -**90**; storage batteries. See STORAGE bats.

STORM phenomena *El Eng* * Aug 24-**92**

STOVE, Giraud's thermo-elec., Hospitalier, abs. *Inst C E* v 105, 106 -**91**, *Genie Civil* * v 19 -**91**, *Sc Am Sup* * July 18 -**91**. See also ELEC. heating

STRESS, optical demonstration of, Rücker *Eng* * May 18, *Sc Am Sup* * May 19-**88**

SUBWAYS, N. Y. Bd. of Elec. Control, report *El Wld* Jan 12-**89**, Jan 25; practical working, Maver, discuss. Mar 15-**90**; of N. Y. City *E News* Apr 21 * May 5, 26; of Phila., cor. * June 9-**88**; of N. Y. *Sci Am* Apr 20-**89**. See also ELEC. wires, underground

SUGAR refining *E News* Sep 22-**88**

SUPPLY, cost, Hopkinson *El Rev Lond* Nov 11-**92**. See also under ELEC. lighting

SWITCH-boards, Manhattan Elec. L. Co. *El Rev* * May 7; multiple, Baylis, July 9-**92**

SWITCHES, designing, Offrell *El Wld* June 21-**90**; and switching *Pwr* * June * July -**91**

TABULATING, Hollerith system, com. report *F Inst* * Apr -**90**. See also CENSUS counting ap.

TANNING *El Rev Lond* June 26 * July 3, 10-**91**, *El Rev* June 14, hist. n *El Wld* Sep 27-**90**

TELEMETER system *E News* Oct 5-**89**; Fiske's (marine dist. instrum.) Brylinski abs. *Inst C E* v 106 -**91** * *An Telegr.* -**91**

TERMS and phrases, Maycock *El Rev Lond* * Mar 25-**92**; (list) *E Rec* June 2-**88**

TESTING, Handbook of, Kempe, bk., Spon; of iron, Swinburne *El Wld* * Sep 27-**90**; ap., construct. and use, Frey * Jan 17-31 * Feb 7-28 * Mar 7, 14-**91**

TIME. See TIME, electric

TRACTION, de Coetlogon *E News* * Aug 18-**88**; the Ries increaser (locomotive) * Aug 9-**90**

Electric TRANSFER table, Sprague, Altoona, Pa. *El Wld* * Apr 13; Fitchburg, Mass. * Nov 16-**89**

TRANSFORMATION, alt. – direct cur., proposed system, Patten *El Wld* * Feb 27 * Mar 19-**92**

TRANSFORMERS *El Eng* alt. cur., Kapp, discuss. (full) * Apr, Apr, new system, Tesla (full) * June, and contin. cur. system, comparative value, Badt, July, Swinburne, Sep -**88**; Ryan, and discuss. (full) * Jan, Jan; effic., Humphrey * July 2-**90**; distrib., Swinburne * Apr 1, 8; alt. cur., geomet. theory of, Steinmetz, June 3-24, July 1-29, Aug 5 - Dec 23-**91**; relation of size and effic., Stillwell, Mar 2-**92**

El Rev Lond alt. cur., Kapp (very full) * Feb 17, distrib. by, Mackenzie * 17, 24, Mar 2, 9, Crompton * Apr 20, 27, May 25; new system, Tesla * June 15, 22, ed. 22; distrib. by, Gutmann, Oct 26; (secondary generator) pats., Gaulard & Gibbs vs. Ferranti, July 13-**88**, Mar 8; Ryan * Jan 17; reg. cur. or poten., E. Thomson's method * Apr 26; hist., Wilking's, Gelyi, May 17, 24; losses due to hysteresis in, discuss., E. Thomson, Tesla, June 13; description, Swinburne (full) Sep 20; Picou, report, 20-**89**

El Rev Lond distrib., Swinburne, Feb 27, Mar 6, 20; effic., Stanley, Mar 6, 13-**91**; relation of size and effic., Stillwell, Apr 22; distrib. by alt. curs., Kennedy, 22, May 6 * 20 * 27; hist. of tension-reducing * May 27; Perry, June 3; tests, Hopkinson report (full) * July 1; effic. at different frequencies, Ayrton, Sumpner * Sep 23, imps. * 23; alt. cur., expts., Fleming (full) * Dec 2-30; Ferranti (full) 30-**92**

El Rev new system, Tesla * June 2-**88**; Ryan, Dec 28-**89**; effic., Humphrey (full) * July 5-**90**; German cur. * June 20-**91**; relation of size and effic., Stillwell, Mar 5; 17,500 watt, test report, diag. Oct 1-**92**

El Wld alt. cur., Kapp * Mar 17, 24; contin. cur., Sellon * May 5; new system, Tesla * June 2; points in distrib. by Gutmann * Oct 13-**88**

El Wld E. Thomson's method of reg. cur. or poten. in secondaries of * Apr 13; Kapp regulating * May 4; and Ganz alt. machine, Forbes * 25; Picou, Sep 7; Paget's alt. cur. * Nov 16; tests, Ryan (full) * Dec 28; design of commercial, Swinburne, 28-**89** * Jan 11, 25, Ryan, discuss. 11; effic., Humphrey (full) * July 5; distrib. by, from cen. and eccen. stations, Ganz system, Fleming (full) 26 * Aug 2-30, Sep 6 * Oct 25 *

Electric TRANSFORMERS

Nov 1-15, 29 * Dec 6, 27-**90** * Jan 10, 24, 31 * Feb 14; mag. circuit of, closed or open, Evershed, Mar 21 * 28 * Apr 4, 18, 25 * May 2, 9, 23 * June 6; distrib., Swinburne * Mar 21, 28 * Apr 4, 11-**91**

El Wld relation of size and efflc., Stillwell, Mar 5; effic., Dobrowolsky * May 28; the Rowland, July 9; Westinghouse 6,500 watt, test, Hopkinson * 16, 23; test of 17,500 watt Stanley, Ryan * Oct 1; effic. at different frequencies, Ayrton, Sumpner * 8, 15; hysteresis measurement in, Evershed * 15, 22; universal, Appolonj * Dec 10; alt. cur. expts., Fleming * 24-**92**

Eng pats., ed. Mar 8-**89**; interference with alt. curs., Ayrton, Mar 27-**91**; Haskin's, bk. n *E News* Sep 29-**92**; alt. cur., Kapp *The Eng* Feb 10-24-**88**; alt. cur., Fleming, bk. review, Aug 26-**92**

TREE felling machine *Sc Am Sup* * Mar **2-89**, *Industries*

UNDULATIONS, Hertz's expts., Bertolini *Eng* * Dec 12-**90**. See also ELEC., Hertz's

UNITS, Crocker *El Eng* Dec 31-**90**; Brit. Assoc. Oct. 14-**91**; the volt, ohm and ampere, Nipher *El Rev Lond* * Apr 27; ohm det., Wuilleumier, July 13; nomen. Dec 7-**88**; and standards, Pellet report, Sep 13, 20-**89**; com. report, Sep 26, Oct 10-**90**; of measurement, absolute, Moon, May 1; and standards, report, Oct 16, discuss. 30-**91**; nomen., Lodge, Aug 12-26-**92**; Crocker *El Rev* Jan 3; and standards, report, Oct 3-**91**

El Wld the volt, ohm and ampere, Nipher, Apr 7-**88**; standards, Pellet, Sep 7, and measures, Internat. Elec. Con., Paris (full) 21-**89**; of present and future, Crocker, Jan 3; Kimball (full) * 17-31; and mag., absolute dimens., Rodgers, May 2; and standards, com. report, Sep 26-**91**; do. Brit. Assoc. Sep. 8-**92**

Eng ohm, Glazebrook, Jones, Sep 26-**90**; new det. of ohm *Sc Am Sup* * Feb 16-**89**; of present and future, Crocker, Apr 11-**91**; (terms) *St R J* Oct-**89**; and mechan. *E & Min* Aug 9, *The Eng* July 4-**90**; electro-magnetic, Nov 27-**91**; standards, com. report, sup. Dec 9-**92**. See also ELEC. ampere — ohm — standards — volt — watt, etc.

VACUUM discharge streamers action, Pupin *El Eng* * Apr 20-**92**; tube discharge, Tesla *El Wld?* June 10 * July 1-**91**

Electric VOLTMETERS *El Eng* the copper, Anderson, Oct -**88**; spiral coil, Ryan * Dec -**89**; best dimens. for standard, Kennelly, Nov 12, 19-**90**; Weston direct reading alt. and contin. cur. * Dec 16-**91**

El Rev Lond portable, for measuring alt. poten. differences, Ayrton (full) * Jan 13-27-**88**; Ayrton & Perry's hot wire * Mar 8; spiral coil, Ryan * June 28; W. Thomson's chain of electrostatic, Meikle * Nov 8-29-**89**; Ayrton & Perry's twisted strip * May 2-**90**; Sankey * Nov 27, Dec 4-**91**; Weston's * Jan 1-**92**

El Wld for measuring alt. poten. differences, Ayrton, Perry * Jan 28, Feb 4, 11; portable, do. Mar 10; Weston's * Nov 17-**88** * Feb 2; instrums. for measuring high potens. * 9; Ayrton & Perry's * Apr 6; spiral coil, Ryan * June 1-**89**; Ayrton & P's twisted strip * May 24-**90**; Weston, as a testing instrum., Merrill * May 21-**92**; and ammeter combination, A. White (full) * *Soc Arts Mass* -**90**

WATER conveyor, Bailey's, n *El Rev* * Aug 2-**90**; purification, Stanley-Quackenboss pat. *E News* May 17-**90**

WATTMETERS, Thomson recording *El Eng* * Nov 5-**90** * June 17-**91**; corrections to readings, Danielson *El Wld* * Mar 5, do. Friese, do. May 21-**92**; for alt. curs., Ganz *Eng* * Apr 5-**89**; abs. *Inst C E* v 94 -**88**, *Cen Elek* -**88**

WAVE and phase indicator, for alt. and undul. curs., E. Thomson *El Rev Lond* * Feb 3-**88**; waves, mechan. actions, Hertz *El Wld* * July 25-**91**; propagation through wires, Hertz * Oct 12, *El Eng* Dec, (full) *Sc Am Sup* Oct 19-**89**

WEIGHING machine, the Snelgrove *El Rev Lond* * Aug 16, *El Rev* Sep 7, *Eng* * June 21-**89**

WELDING *Am M E* Woodbury v 10 -**89**; *Am Min* E. Thomson v 19-**91**; and metal working, Wood, v 20 -**92**; *Cassier's* welded projectiles, Maxim * Oct -**92**

El Eng aut. machines, Lemp (full) * June 4; E. Thomson, Oct 8-**90**; practical aspects, Perrine, May 27-**91**; *El Rev Lond* * Jan 6; E. Thomson * Nov 16-**88**; Benardos system, Jan 1-**92**; proc., Lodge on, Varley (full) July 18, *Industries* June 27-**90**

El Rev Woodbury, Oct 27, tests, table, Nov 3-**88**; aut. machines, Lemp (full) June 7; applied to manuf. of projectiles, Wood, Nov 1-**90**; practical aspects, Perrine, May 30, discuss. June 13; Okonite Co's plant * Oct 24-**91**, welded projectiles. Maxim, Aug 6-**92**

Electric WELDING

El Wld Benardos', by means of the arc * Feb 25; tests, table, Dec 1-**88**; Thomson's * Feb 9-**89**; aut. machines, Lemp (full) * June 7; Coffin's incand., new method * Sep 20; E. Thomson, Oct 11; in projectile manuf., Wood, Nov 15-**90**; pract. aspects, Perrine, May 30, E. Thomson, June 6-**91**; Benardos' system, by elec. arc * Jan 16; in wire indus., Bullard, abs. Mar 12; and metal working, Royce, Nov 12-**92**

Eng Benardos' system * Dec 25-**91**, do. St. Petersburg * Jan 27; Thomson's * Dec 14-**88**, do. Fish, Oct 4-**89**; *E Mag* Pope * July -**91**; *E & Min* Thomson's, n * Nov 17-**88** * Feb 9; Howe's Metallurgy of Steel (bk.) sup. May 11-**89**; arc * Sep 13; aut. machine, Lemp * Nov 29-**90**

E News Benardos' method, Apr 7; proc. * May 5-**88**; Thomson proc., expts. Mar 9, 23; fibrous structure of elec. welds * Sep 14, 21-**89**; Fish, Jan 18; (full) * Nov 15-**90**; pract. aspects, Perrine, June 6-**91**; *E Rec* Woodbury, Nov 17 -**88**

F Inst Woodbury, Dec; Thomson * Nov -**88**, Thom. Elec. Welding Co., U. S. Naval Bd. report, July; Thomson's, notes from Paris exhib., Hering, Sep -**90**; *Inst C E* applic. of electricity to welding, stamping and other cognate purposes, Bramwell, and discuss. (very full) * v 102-**90**, pract. aspects, Perrine, abs. v 105-**91**, 107-**92**, *Am Inst Elec Engrs* -**91**; of metals *Locom* Nov -**88**; Benardos' method, Ruhlmann *R & Eng* * Feb -**88**, *Electrician Lond*

R Gaz Woodbury, and discuss., abs. Nov. 2-**88**; wire cable, Stuart, Bullard, July 19; of rails, Ries, cor. Sep 27-**89**; of projectiles, Wood, Nov 7-**90**; cost, May 1; uses, Perrine, 29, E. Thomson, discuss. June 12-**91**; elec. blow-pipe, Sheldon *Sci Am* Feb 2-**89**

Sc Am Sup Benardos' * Mar 3; applics., Stuart, July 21, Oct 20-**88**; Thomson's * Jan 26-**89**; weldable by electricity (list) n Aug 16; prog. * Sep 20; of projectiles, Wood, Nov 22, 29-**90**; Dewey * Jan 17-**91**; Benardos-Howard proc. * Feb 6-**92**; *Soc Arts Mass* of projectiles, Wood -**91**

The Eng Thomson's machines, Paris exhib. July 5-**89**; ed. Feb 21, cost, n 28; Bramwell, Apr 18; Woodbury, June 27; arc C. L. Coffin, n * Sep 12; of projectiles, Wood, Dec 5 -**90**; Benardos-Howard proc. * Dec 25-**91**, machine * Feb 26 -**92**

Electric WINDING coils data, table, Wheeler, *El Eng* May -**88**; the Bell compound, for constant poten. *El Wld* * Nov 29-**90**, do. abs. *Inst C E* v 103 -**91**, *El Eng* v 10 -**90**

WINDLASS *El Rev Lond* * July 3-**91**

WIRE covering machine, Barraclough's *El Rev Lond* * Mar 14-**90**

WIRES *El Eng* Brackett addr. Feb -**89**; tests, Paris exhib., Hering, May 14; Kerite insul. manuf. * Nov 12; insul. and cables testing, Webb * 19, 26 * Dec 3-31-**90** * Jan 7-28 * Feb 4-18 * Mar 4-18; cop., temp. correction for, Hering, Jan 7; temp. coeffs. det. of german silver, Sheldon * June 10-**91**; overhead construction, Peck * Mar 2-**92**

El Rev Lond overhead vs. underground, Wheeler, Nov 2; sizes, table, 16; lead covered cables, ed. Dec 28-**88**; overhead (mechan. strains) S. Russell, Oct 24-**90**; *El Rev* Brackett addr. (full) Jan 12; disruptive discharges in lead cables, Rudd * Mar 9-**89**

El Wld rules for overhead conductors, N. Y. Bd. Elec. Control, Dec 8-**88**; Cobb vulcanite manuf. * Jan 5; Am. insul., tests, Wilkes (full) * 26, Feb 9; disruption discharges in lead cables, Rudd * Mar 2-**89**; insul., commercial measurement of, Hering * Mar 7; large compounded, table, do. 28; cable testing, Fisher * June 27 * July 4-18-**91**; overhead construction, Peck * Mar 5-**92**; do. vs. underground, Webb *E Mag* Aug -**91**; Johnson Interior Conduit and Insul. Co. system, com. report *F Inst* * Mar -**91**

UNDERGROUND *El Eng* undergrounding of arc, Leggett, Mar; N. Y., Wheeler, Sep; disruptive discharges relation to, Acheson * Sep -**88**; com. report, Mar -**89**; N. Y. subways practical working, Maver (full) Mar; high tension, English authorities on, Apr 2; Edison tubes system * July 2-**90**

El Rev Lond system, Brooks * Feb 3; N. Y. vs. overhead, Wheeler, Nov 2-**88**; District Columbia, U. S. Mar 22; Verity, Apr 26; N. Y., Bd. Elec. Control report, Jan 25, Wheeler, May 3-**89**; Brooklyn subways, com. report, Jan 24, 31, Feb 7-21-**90**; cables, S. A. Russell * Mar 13, 20-**91**

El Rev arc light, Leggett, Mar 3, 3; N. Y. Bd. Elec. Control (full) July 28; disrupt. discharges relation to, Acheson, sup. * Sep 8; and overhead, Wheeler * 15-**88**; Brooklyn commission report, Jan 5; Johnstone conduit system * Feb 23, 23; com. report, Mar 2: N. Y. arc, Wheeler, Apr 20-**89**;

Electric WIRES, Uunderground

Brooklyn subways report (full) Jan 4-**90**; construction * Mar 5-**92**

El Wld Brooks system * Jan 21; disrupt. discharges relation to, Acheson * Sep 8; and overhead, N. Y., Wheeler (full) 8-**88**; conduits, com. report, discuss. (full) Mar 2-**89**; N. Y. subways, Maver (full) * Mar 1; Munsie-Coles conduit system * June 14; Edison tubes system * July 5; conduits, com. report, Aug 30-**90**; construct. and maintenance, Fowler, Sep 5-**91**; and discuss., Francisco, Mar 5; N. Y. city * Apr 23-**92**

Eng Waring's cables * Oct 19-**88**; Paris mains * Jan 30 * Feb 6-27-**91**; vs. overhead, Webb *E Mag* Aug -**91**; N. Y. subways *E News* Apr 21 * May 5-26; Phila. June 9-**88**; Paris * Jan 25-**90**; Washington, D. C., Elec. Commission report, Nov. 7-**91**; N. Y. Bd. Elec. Control report *E Rec* * Jan 14-**88**; Europe *R & Eng* * May -**90**; number in various cities *Sci Am* Dec 1-**88**; cables, W. Siemens (full) *Sc Am Sup* Aug 10-**89**; construct., Fowler, Sep 26-**91**

WIRING chart, Waring *El Eng* * Oct 8-**90**; and ins. rules, N. E., com. report, Sep 16-**91**; of buildings, Andrews *El Rev Lond* Apr 5-**89**; Andrew's concentric system * May 15-**91**; houses, Segundo, Jan 1 * 8, 29-**92**; leads for, graph. method of cal., Hering *El Rev* * May 30, do. *El Wld* * May 30-**91**; of buildings, standard rules, Crockett, Apr 20; Colonnade hotel, Phila. May 11; Interior Elec. Conduit Co. system * Nov 30-**89**; diag. for cal. length of wire *E News* July 11 * Sep 12; safe rules, com. report *E Rec* Oct 10; kinks, Francis *Pwr* * Aug; safe, Elec. Light Assoc. report (full) Oct -**91**; spec., Lond. *Sc Am Sup* Oct 13-**88**; of buildings, Andrews * May 25-**89**, *El Eng Lond*

WORLD offices, N. Y. *El Wld* * Jan 11-**90**

Electricians, eminent, facts, Weyde *El Rev* Nov 14-28, Dec 5, 19-**91**, Jan 16, 23-**92**; the electrician in war, Fiske *El Wld* Nov 1-**90**

Electricity, Modern, Kirwan, bk., Boston, 1889; and haulage, Pocock *Am Min* v 18 -**90**; *El Eng* Brit. Assoc. papers, Lodge, Nov -**88**; Paris exhibits, Hering * May 14, 21 June 26; dangers, Morton, Aug 27-**90**; in transitu from plenum to vacuum, Crookes * Feb 4-18-**91**; magneto-electric. discovery, America's part in, work of Farraday and Henry * Jan 13, 20 * Feb 3-17 * Mar 9-**92**

Electricity

El Rev Lond in Gynæcology, Burton, Nov 1-**89**; ether and matter, Gray * Feb 13, 27; in relation to human body, Lawrence, Mar 27, Apr 3-**91**, human body as a conductor of, do. Aug. 12, action of alt. curs. on, Korthals, Oct 14; for curative purposes, Aug, Sep, ed. 23-**92**

El Rev and light, identity of, Hertz, Dec 14-**89**; dangers of, Morton, Aug 30; in daily life, bk. review * Dec 27-**90**; in transitu from plenum to vac., Crookes (full) * Feb 14; history (Leyden jar), 150 years ago, Weyde * Oct 17, 24 * Nov 21 * Dec 12-**91**; radiation of energy, Trouton, Mar 19; correlation of with heat, Preston, Apr 2; mod. views, Stanley, 16; what it is Jacques, May 21; medical, files Sep-Dec -**92**

El Wld thermo-electricity, Acheson * Feb 25-**88**, do. Rust * July 27 * Aug 3, 10-**89**; dangers of, Morton, Aug 30; the electrician in war, Fiske, Nov 1-**90**; in transitu from plenum to vac., Crookes (full) * Feb 7-21; as the rival of steam, Bell (full) Mar 14; electric., galvanism, magnetism and the telegraph, chronol. hist., Mottelay (very full) * Apr 18- * Oct 24, Nov 7 - Dec 26-**91**, Sep 3, pors. * 10 - * Oct 22 - Dec 31-**92**, etc.; elements of practical, Bell (full) * Sep 5, 12, 26 * Oct 3 - Dec 26-**91**; * Jan 2 - * Feb 20, Mar 12; Buffalo features, Hering (full) * Feb 13; at World's Columb. exhib. Aug 20, 27, Sep 3, 17, Oct 8, 22 * Nov 5, 26 * Dec 24, 31-**92**

Eng as applied to eng., Geipel, Feb 17, 24-**88**; and gas, comparative cost, ed. July 10; chronol. hist. of, Mottelay, June 5, 12, 19, July 3, 17, 24, Aug 7, 14, 28, Oct 2, 16, Nov 13, Dec 11-25-**91**, Jan 8-22, Feb 5, 26, Mar 4-**92**; and gas, relative cost, Humphreys *E Mag* Nov -**92**

E News from water power, Belknap water motor and dynamo * June 15; a decade of prog. in, July 27-**89**; heat production from, ed. Aug 9; dangers of, Morton, Sep 6; in warfare, Fiske * 20, 27-**90**; as a mode of motion, Kropotkin * June 30-**92**

F Inst mod. conceptions of, Duncan, Aug; in warfare, Fiske, Sep -**90**; its past, present and future, Pope, Jan; events, chronol. Feb; as the rival of steam, Bell, Mar -**91**; applics., lectures (bk.) *Inst C E* -**84**; as applied to eng., Geipel, and discuss., insets (full) *Inst M E* * Feb -**88**; possibilities of, W. Crookes (suggestive) *Littell's* Apr 9-**92**, *Fortnightly Rev;* recent science, Kropotkin (nature) 19*th Cent* May -**92**; lessons *Pwr* files * Jan -**91** etc; latest discov., Gordon *R & Eng* June -**92**

Electricity
Sc Am Sup position and prospects as applied to eng., Geipel (full) Mar 10, 17; applics., Preece (full) Sep 29-**88**; light and heat, Brackett, Feb 2, 9; in the engine room * Dec 14-**89**; in warfare, Fiske, Sep 20, 27-**90**; in transitu from plenum and vac., Crookes (full) * Mar 7, 28-**91**; what it is, expts., Jacques, June 4; commercial, Spaulding *Tech Q* Apr -**92**. See also under ELEC. eng; ELECTRO-

Electro-culture (plants), report (full) *El Rev* * Oct 17-**91**

Electrocution, of Kemmler, Talbot *El Rev* Apr 25-**91**; Heinrichs *Sc Am Sup* Aug 10-**89**. See also ELEC. execution

Electro-deposition, arr. of vats in, Mailloux *El Eng* Jan 14-28; Wilkes, Feb 11-**91**; of platinum, Wahl, July 16, *El Rev Lond* July 11, *El Wld* June 28-**90**

Electro-dynamic machinery, theoret. elements of, Kennelly *El Eng* * July 6, 20 * Aug 3, 31, Sep 7-**92**; actions, speed of diffusion, Hertz *El Rev Lond* Nov 9, 16-**88**; dynamics of stationary bodies, do. *El Wld* Sep 20, 27, Oct 18, 25, Nov 8, 15 -**90**, *Electric Lond*; force produced by dielectric in elec. field, Röntgen, abs. *Inst C E* v 92 -**88**, *Sitzung Akad Berlin* -**88**; dynamics, new, Lowe *Sc Am Sup* * Oct 12-**89**

Electro-dynamometers, for measuring alt. curs., Maneutrier, abs. *Inst C E* v 92 -**88** *Compt r* v 106 -**88**; for three-phase curs., Zickermann, abs. *Inst C E* v 108 -**92**, *Elek Zeit* -**91**

Electrograph (meteorological) Warner *El Rev* * Nov 22-**90**

Electrolysis, of iron salts, Watt *El Eng* Jan, Feb, Apr, June, July, Sep, tin salts, do. * Oct – * Dec -**88**; of cop. sulphate in standardizing elec. instrums., Meikle *El Rev Lond* * Mar 23, 30; of lead salts, Watt, Apr 6, 13, 27, of tin salts, do. * Sep 14, 28 * Oct 5-**88**; commercial, Andreoli, Oct 28, Nov 4, do. *El Rev* Dec 3; commercial, Swinburne, Aug 20, 27, do. *El Wld* Sep 3-24-**92**, Andreoli, Nov 26-**91**, Dec 10, 17-**92**; by the alt. cur., Mengarini * Aug 8-22; and actinism, Houston *F Inst* Dec -**91**; various substances *Sc Am Sup* * Sep 6-**90**; of water, hydrogen and oxygen production, industrial voltameter * Sep 12-**91**

Electrolytes, spec. inductive capac. expts., Rosa (full) *El Wld* * Oct 8-**92**

Electro-magnet, S. P. Thompson (very full) *El Rev Lond* * Sep 19 – * Dec 26-**90**, Jan 2-**91**, fallacies, do. *El Rev* Dec 13, 20 -**90**, types, Jan 24-**91**, do. (full) *El Wld* * Aug 30 * Sep 6, 27- * Dec 6-20-**90**, do. (very full) *Sc Am Sup* * Nov 22, 29 * Dec

Electro-magnet
6, 13, 20-**90** * Jan 10-31 * Feb 7, 14-**91**; a big, *Locom* Jan -**88**, *E & Min;* King's great *The Eng* Feb 10-**88**

Electro-magnetic, radiation, Fitzgerald *El Eng* * July 16-**90**; induction researches, Vignoles *El Rev Lond* * May 29-**91**; shunts, Moon, Jan 22; ampere-centimeter, a measure of electro-magnetism, Hering, July 29-**92**; radiation, Kimball *El Rev* * Dec 20, do. *El Wld* * Nov 8, 15-**90**; mechanisms, S. P. Thompson * Jan 17, 24 * Feb 21-**91**; machinery, notes, Aldrich (full) * Feb 13, 27 * Mar 19 * Apr 2, do. *F Inst* * Feb * Mar, do. *Pwr* * Mar -**92**; radiation, Fitzgerald *Sc Am Sup* * Aug 30; separator, Hall, cor. *The Eng* * July 18-**90**

Electro-metallurgy, Swan *El Rev Lond* Nov 25; Cazin *El Wld* * Apr 30, May 7, 14, 28, June 4, July 23, 30, Aug 6-20, Sep 3-24 * Oct 1-15-**92**; metallurgical processes, consumption of energy in, Pouthiere, abs. *Inst C E* v 98 -**89**, *Lum Elec* v 33 -**89**; Swan *Sc Am Sup* Oct 29-**92**; machine, Lauffen-Neuhausen *The Eng* Oct 5-**88**

Electrometer, guard-ring, for contin. readings, Jaumann, abs. *Inst C E* v 92 -**88**, *Central Elek* -**87**

Electro-motive properties of the human heart, Waller *El Rev Lond* * Oct 12-**88**

Electro-motors, governing, Ayrton, Perry *El Rev Lond* July 20-**88**; 'Agir' prize motor *E & Min* * Dec 7-**89** * *Industries.* See also DYNAMOS; ELEC. motors

Electro-physiology, D'Arsonval *El Wld* Oct 5, 12-**89**

Electro-plating dynamo, efficient, *El Rev Lond* * May 1-**91**

Electrostatic screening by gratings, etc., W. Thomson *El Rev Lond* Apr 17; ratio to electro-mag. induction, expts., Kennelly, June 12; induction, Taylor * July 31 * Aug 7-**91**; alternators, Muras * June 17-**92**

Electrotechnics, Ayrton, Pres. addr. *El Rev Lond* Jan 29-**92**

Elements and meta-elements, Crookes *Sc Am Sup* May 5-**88**

Elevated railroads. See RAILROADS Elevated

Elevators, Weehawken and viaduct, T. E. Brown, insets *Am C E* * v 27-**92**; brake straps lining material, Leavitt, discuss. *Am M E* -**88**; elec., and hoist *El Eng* * Oct 29-**90**; Sprague-Pratt elec. (full) * Nov 2, do. *El Wld* * Apr 2-**92**; elec., and (dock hoist) * Nov 1-**90**; Otis elec. * July 4-**91**

Eng Eureka safety hoist, n * Nov 16-**88**; Smith & Stevens', with safety gear * Mar 1; Eiffel tower hydr. lifts, Otis', Roux,

Elevators

Ansaloni, etc. * July 5-19; St. Lazare R. station, Paris, wagon hoists * 12-**89**; City & So. Lond. R. hydr. hoists * Dec 26-**90**; floating and spoil distributor, Baltic Sea canal, inset * Feb 20; Otis Pass., No. Hudson Cty. R., Hoboken, inset * May 22 * June 5, do. inset *E News* * Jan 17-**91**; pass., ed. Aug 10-**89**; Reno. continuous * Aug 25; Sprague-Pratt elec. * Nov 24-**92**

E Rec Eiffel tower lifts, Ansaloni, Aug 24 * Sep 7-**89**, do. elec. helicoidal, Audra, abs. *Inst C E* v 94 -**88**, * *Genie Civil* * v 13-**88**, do. insets *Inst M E* * July -**89**; evolution of, Sheridan *E Rec* Jan 24-**91**, *J Assoc E Socs*; Hall's hydro-steam, Hinchliffe, abs. *Inst C E* v 106 -**91**, *Tech Soc Pac Coast* -**91**; Weehawken, T. E. Brown, inset *R Gaz* * Jan 22; hydr., effic., Gale, Dec 30-**92**; Eiffel tower, Paris exhib., Nansouty *Sc Am Sup* * Apr 27-**89**; floating and spoil distrib., Baltic Sea canal * Mar 28-**91**

The Eng Stevens & Major's hydr. pass. lift, May 18; spiral elec., for Eiffel tower, Aug 3; Archer's hydr. balance, Columbus monument, Barcelona, Nov 23, 23-**88**; at Eiffel tower, Roux hydr. * Mar 22, Otis, Edoux and Roux, July 19-**89**; for Eddystone light-house model, Naval exhib., Lond. * Aug 21-**91**. See also CANAL lifts, Fontinettes; HYDR. lifts; RAILROADS, incline

Ellipses, the false, reduced by by equations of condition, Würtele *Am C E* * v 24-**91**; spacing, Grant *F Inst* * Apr -**89**; confocal, and applic. to mechanism, Gale * Feb -**91**; drawing by arcs of circles, Honey *Sc Am Sup* * July 5-**90**, and equiv. ovals of equal areas, do. * May 9-**91**. See also CURVATURE; DRAWING

Elswick arsenal and shipyard, inset *Eng* * Oct 18, 25 * Nov 1-29, Dec 6-**89**

Emery wheels, Paret *F Inst* * Mar -**90**; Am., 15 varieties, comparison, com. report, Nov -**91**; mounting *R & Eng* * Feb; French and Am. practice, cor. Mar -**89**

Emmons, Samuel F., por. *E & Min* * Apr 18-**91**

Employer's liability, ed. *Eng* Nov 16; do. accidents to workmen *The Eng* June 22, 29-**88**, *Genie Civil*

Energy, elec., from solar radiation, Osmond *El Eng* Mar -**89**; dissipation of, Kelvin *Littell's* May 14-**92**; conservation of *Locom* Oct -**89**; ed. *The Eng* Sep 28; Mulciber, cor. Oct 12, ed. 12, cor. 26, Nov 2, 9, Cherry, cor. Dec 7; Force and, theory of dynamics, Grant Allen, bk., Longmans, Lond. '88, Nov 30-**88**. See also ELEC. energy; FORCE

Engineer, the, his commission and achievements, Babcock *Am M E* v 9 -**88**; of the future, Barr *Eng* Oct 19, 26-**88**; who is an engineer, O. Smith *E Mag* Feb; financial status of, Gobeille *E Rec* May 14 *J Assoc. E Socs* Mar -**92**; use of theory in the work of an, Unwin *The Eng* Nov 16-30, Dec 7-**88.** See also ENGINEERS

Engineering (general), including Civil and Mechanical eng; prog., Becker, Pres. addr. *Am C E* v 20 -**89**; do. '89, Shinn, Pres. addr. v 22 -**90**; beginnings of, Watkins, and discuss., insets (full) * v 24; prog., Chanute, Pres. addr. (full) v 24 -**91**; (branches of) Grimshaw *Cassier's* Aug -**92**; eng. feats in the West, E. Ingersoll *Chaut* Oct -**88**; prog., Bellamy (ideas) *El Rev* Jan 11-**90**, *Harper's M* Dec -**89**

Eng electricity as applied to, Geipel, Feb 17, 24 * Mar 2, 9; theory, uses of, Unwin, Nov 16, 23-**88**; three aspects of, ed. July 22-**92**; what eng. owes to chemistry, Griswold *E Mag* Nov -**92**; how to begin in, ed. *E News* May 12-**88**; prog. in 1888, Cochrane, addr. June 1; do. Becker addr. 29-**89**; Cooley, Pres. addr. *E Rec* Feb 28; inspection, Nichols, Mar 21, 28-**91**; review of prog. *F Inst* Feb; is it on the decline, Le Van * July -**88**; prog., Sec'y report, Feb -**89**; prog., Bruce, Pres. addr. *Inst C E* v 91 -**88**; prog., relation to social progress., Berkley, Pres. addr. v 107 -**92**; prog., Pres. addr. *Inst M E* May -**92**; index of current literature *J Assoc E Socs* Nov -**88** and files; fifty years ago, stat. *Locom* July -**88**, *R & Eng;* prog., Chanute, Pres. addr., abs. *R Gaz* May 29, do. (full) *Sc Am Sup* Aug 8, 15-**91**; some eng. works, Corthell (full) Aug 2, 9-**90**

The Eng review of prog. Jan 6, 13-**88**; prog., ed. Jan 4-**89**; review of, ed. Jan; finance, costs, estimates, prices, Dec 19-**90**; review of '91, Jan 2; finance, ed. 16, do. shop orders, Apr 24, works accounts, stores management, Sep 4, 11; works, Ansaldo & Co., Sampierdarena * Mar 27-**91**; prog. review (full) Jan 1; prog., Unwin, Pres. addr., Brit. Assoc. Aug 5, 12-**92.** See also BRIDGES; BUILDING; ELECTRIC — HARBOR — HYDRAULIC — MARINE eng; MATERIALS; METALS; MILITARY — MINING — MUNICIPAL — NAVAL eng; RAILROADS; ROADS; SEWERAGE; TELEGRAPH; TUNNELS; WATER-works, etc.

ALPINE. See ALPINE engineering

AMERICAN Academy of, proposed, Pope *R Gaz* Nov 29-**89.** See also ENGINEERS, Am. Acad.

ASSOCIATIONS. See ENGINEERS' Societies

Engineering, CIVIL, advancement of the profession of the civil engineer, Herschel addr. *E News* Apr 11, 18, May 2-**91**; the water-jet as aid to construction *E Rec* Aug 3-**89**; embankments, direction of earth thrust against a wall, F. P. Spaulding *Lehigh Eng J* Apr -**88**; in Brit. colonies, Coode *Sc Am Sup* Jan 11-**90**, *Inst C E*; topography, geology and geodesy, summer course in, Burton and Swain *Soc Arts Mass* -**89**. See also ARCHES; BEAMS; BRIDGES; BUILDING; CANALS; CEMENTS; CONCRETE; CULVERTS; DAMS; EARTHWORK; ENGINEERS; EXCAVATING; FOUNDATIONS; HARBOR-HYDRAULIC eng; INSTRUMENTS; LAND; LAW; MAPS; MATERIALS; MILITARY—MINING—MUNICIPAL eng; PAVEMENTS; RAILROADS; RESERVOIRS; RETAINING walls; ROADS; SEWERAGE; STREETS; SURVEYING; TUNNELS; WATER-works, etc.

CITY. See MUNICIPAL engineering

CONGRESS, Internat., ed. *Eng* June 12-**91**, 1893 *E Rec* Nov 1, Chic. convention report *R Gaz* Nov 14-**90**

CONSTRUCTION, I. O. Baker, bk. review *E News* Oct 19-**89**. See also BUILDING; FOUNDATIONS; MASONRY; RAILROADS, construction, etc.

EDUCATION of apprentices, Garnett *The Eng* Oct 25-**89**. See also EDUCATION; ENG. schools

GOVERNMENT, Nat. Pub. works *F Inst* Aug -**88**

LABORATORY, need of an, Potter, Pres. addr. *Am Min* v 17 -**89**; notes, Beare *Eng* Mar 4, 11-**92**; the Walker labs., Liverpool *The Eng** Nov 8-**89**. See also ENG. schools; SCHOOLS

LITERATURE index. See INDEXES

MECHANICAL, the steam engineer, Laurie *Cassier's** Sep -**92**; steam in mod. civilization, Loring, Pres. addr. *Am M E* v 13 -**92**, *E News* Dec 8-**92**; dynamics, a question of, Gilman, cor. July 14-**88**; heating water, notes *Locom* Mar; the chalk age of, Holloway *Sc Am Sup* June 16-**88**; in elec. industries, Perry (full) Dec 7-**89**. See also AIR engines; BELTING; BOILERS; BOLTS; CHIMNEYS; COAL; CRANES; DYNAMICS; DYNAMOMETERS; ELECTRIC eng: ENERGY; ENGINEERS; ENGINES; FORCE; FRICTION; FUEL; FURNACES; GAS; GASES; HEAT; HEATING; HORSE power; LOCOMOTIVES; MACHINERY; MACHINES; MACHINE shops; MARINE boilers, engines; MECHANICS; MILLS; POWER transmission; PUMPING engines; RAILROADS; STEAM; STEAM hammers; heating, plants; TELPHERAGE; TURBINES; WIRE ropes, etc.

Engineering, MINING. See MINING engineering
MUNICIPAL. See MUNIC. eng. and also under names of cities
NEWS, growth of, ed. *E News* Oct 6-**88**
NOTES, best form of scrap cabinet for, T. Miller *E News* * Feb 1; from the far west, Fowler, cor. Oct 18-**90**
SCHOOLS, graduating theses, premiums for *E News* Jan 30, of U. S. Mar 19 — May 5, 19, 26, June 9, 30 — * Sep 22, Oct 6 — Nov 24, Dec 1-22-**92,** etc. See also SCHOOLS
SOCIETIES, Am., comparative growth, ed. *E News* Sep 22-**88**; financial management of, table, Dec 13-**90.** See also ENGINEERS; SOCIETIES
Engineers, demand and supply of (Eng. Schools), table *E News* Aug 4; consulting practice, ethics of, ed. Nov 10-**92**; contractors and the public *E Rec* Oct 3, Nov 7, McMath, Dec 5-**91**; Brit. colonies as fields for civil, Coode. Pres. addr. *Inst C E* v 99 -**90**; Am., professional status, Crowell, cor. *R Gaz* Dec 16; World's Congress of *Sc Am Sup* Feb 20-**92**; function of in contracts, legal decis. *The Eng* Dec 4-**91.** See also ENGINEER
AMERICAN, in Europe *Eng* July 5, 12, 26-**89**; guests of *E & Min* Sep 20, Oct 11-25, Nov 1-**90**
AM. Academy of, proposal for *E & Min* Dec 14, proposed, Pope *R Gaz* Nov 29-**89**
AM. Institute Electrical, pro., pors. *El Wld* * May 30-**91.** See also ELEC. engineers
AM. Soc. Civil pro. *Eng* Apr 20, May 4-**88,** Feb 14, Aug 29 * Sep 5, 12-**90,** Aug 14 * 21, 28-**91**; *E News* Jan 21, July 7, 14, Oct 20-**88,** Jan 19, June 29, July 6-**89,** membership, etc. Jan 18, founders of, cor. Mar 8, July 5, 12-**90,** geographical distrib. of voting members, map * Jan 10, an. meeting, 24, Lookout Mt. May 30-**91,** Jan 23, June 2, 16, Cohen addr. July 7-**92**; *E Rec* June 29-**89,** July 5-**90,** Jan, May 30-**91,** June 11, 18-**92**
R Gaz July 6-**88,** June 28, an Am. Soc. proposed, J. B. Johnson, Aug 23, reorganization, ed. Oct 25-**89,** Jan 10, 17, July 4-**90,** May 29-**91,** June 17-**92**; *The Eng* June 1-**88,** July 8-**92**
AM. Soc. Mechanical pro. Phila., Nov '87, Nashville, May '88, v 9-**88,** Scranton; See, Pres. addr. Oct '88, Eric, deceased members and rules, May '89, v 10 -**89,** N.Y. Towne, Pres. addr. Nov '89, Cincin., memorial notices, May '90, v 11 -**90,** Richmond, European trip of, Nov '90, Prov., O. Smith, Pres.

Engineers, AM. Soc. Mechanical
addr. June '91, v 12 -**91,** N. Y., R. W. Hunt, Pres. addr. Nov. '91, San Fran. May '92, v 13 -**92**; *Cassier's* * Dec -**91**
Eng * Jan 6, 13, 27 * Feb 3 * July 6-20-**88,** Jan 11 * 18 * July 5, 19, 26, Aug 2-**89** * Jan 10-31 * Feb 7 * July 4-25 * Aug 1-**90** * Jan 9-23, July 3 * Sep 11-25, Oct 2, Dec 11, 18-**91**; *E & Min* Richmond meeting, Nov 15-**90**; June 27-**91**
E News May 19, 26, Oct 27, Nov 3-**88,** May 24-24-**90,** Prov. June 20, 27, ed. Nov 21-**91,** Dec 8-**92**; *E Rec* June 20, 27-**91,** Dec 10, *Iron Age* * Dec 8-**92**; *Pwr* July -**91**; *R Gaz* May 11, 25, Oct 19-**88,** Erie, May 24; * Nov 22, 29-**89,** Cincin. May 23; Nov 14, 21-**90**; Prov. June 26; Nov 20, 27-**91** * Dec 2, 9-**92**
AM. Inst. Mining. See MINING engineers
CANADIAN Soc. Civil pors., Houghton *Cassier's* * Nov, inset * Dec -**92** * Jan -**93,** pors. *El Rev* * Aug 29, pors. *El Wld* * Sep 12-**91**
CITY, duties of, ordinance, Salt L. City, Utah *E News* Aug 30 -**90**
CIVIL. See ENGINEERS, Am. Soc. Civil — Canadian
CLUB of, Phila. pro. *E News* June 30-**88**
ELECTRICAL. See ELEC. engineers
ENGLISH societies, notes, cor. *E News* Mar 15-**90**
FRENCH gov't. *E News* Oct 25-**90**
GERMAN Soc. pro. *Eng* Sep 5-**90**
INST. Civil, London, pro. *Eng* Nov 15-**89,** Oct 17, bk. n Nov 21-**90,** May 29, Nov 13-**91,** review, Dec 30-**92**; *E News* June 30-**88,** benevolent fund of, July 26, history, ed. Dec 6-**90**; *Inst C E* building v 94 -**88,** an. report, v 98 -**89,** v 102 -**90,** v 106 -**91**; v 110 -**92**; *The Eng* open hearth steel for boiler making, Jan 20; Mar 2, 16, Apr 6, May 11, bk. n Nov 16, 30, Dec 7-**88,** Pres. addr. Nov 15-**89,** Mar 14, 21-**90,** Nov 13, 20 -**91**
INST. Mechanical pro. *Eng* Feb 10, 17, May 11, Carbutt, Pres. addr. Aug 3, 3, 10, 10 * 31; Nov 2-**88,** Feb 1-15, Pres. addr. May 10, 10, 24, July 5, 12, Nov 8-**89,** Jan 31, Feb 7, Tomlinson, Pres. addr. May 9, 9, Aug 1, 8, Oct 31, Nov 7-**90,** Feb 6, Mar 27, May 8, June 31, Aug 7, Oct 30, Nov 6-**91,** Feb 12, Anderson, Pres. addr. May 13, 13, 20, July 29, Aug 5, Oct 28, Nov 4 -**92**
E News Aug 16, 23-**90,** an. meeting, Feb 21, Aug 22-**91,**

Engineers, INST. Mechanical
an. Feb 27-**92**; *Inst M E* list, by-laws, etc., Cochrane, Pres. addr. May -**89**, Tomlinson, Pres. addr. May -**90**, list members, Oct -**91**, Anderson, societies' prog. May -**92**; *The Eng* Aug 3, in Ireland, 10, 24-**88**, Paris exhib. July 5, 12-**89**, Tomlinson, Pres. addr. May 9-**90**; July 31-**91**, Anderson addr. May 6; July 29, Aug 5, Oct 28, Nov 4-**92**
MECHANICAL, advice to young, Perry *Sc Am Sup* * Sep 1-**88**. See also ENGINEERS, Am. Soc. Mechan — Inst. Mechan.
MUNICIPAL. See MUNICIPAL engineers
WATER-works, the practice of, ed. *E News* Mar 22-**90**

Engine room, experience, Lyne *Am M E* * v 10 -**89**; appliances *Pwr* * Jan - July * Sep - Dec -**90** * Jan - Apr * June - Dec -**91** * Jan - Dec -**92**; telegraph, Thackeray & Hurn's *The Eng* * Jan 17-**90**

Engines, *Am C E* wastes, Thurston * v 23 -**90**; *Am M E* steam consumption at various speeds, Denton-Jacobus * v 10; non-condens., cost of power, Emery * 10-**89**; Hirn & Dwelshauver's theory of, Thurston, v 11: transmiss. of force in, general solution, Jacobus * v 11 -**90**; limitations of economy, Nagle v 13; econ. and effic. of, Peabody, v 13 -**92**; aut.. economics of, Thurston *Cassier's* * Nov -**92**; principles and development, Dickerson addr. (full) *El Rev* * Jan 26, Feb 16-**89**

Eng heat in the, Dwelshauvers-Dery, Donkin * July 27; for elec. light, Glasgow exhib. * Aug 3-**88**; theory of the, ed. Mar 29, Apr 12 * May 31, June 21, 28; stationary, Paris exhib. Aug 16-**89**, hor. do., inset * Jan 3; Fairfield works, Govan * Sep 26 * Oct 3, 24 * Nov 21 * Dec 12; small, econ. of, ed. Nov 14-**90**; stationary practice in Am., Stanwood * Jan 2, 16, 30 * Feb 20 * Mar 13 * Apr 17 * May 1, 8, 29 * June 12, 26 * July 10-**91**; Thurston, bk. review, Sep 2; heat distrib. in * Nov 25-**92**

E Mag the prime mover, Iredell * July -**91**; steam and development of power by the steam engine, Isherwood *F Inst* Oct, Nov -**90**; economics of aut., Thurston, insets * Oct -**92**; vel. variations, cyclical, Ransom, inset *Inst C E* * v 98 -**89**; 2000 h.p., Warren, R. I. *Pwr* * June -**89**; new developments in eng., Rockwood, June -**92**; econ. of non-condensing, Willans, trials *R Gas* Apr 6-**88**; thermodynamics of, Peabody, bk. review, table, June 26-**89**

Sc Am Sup mod. improvements, S. A. Smith, Mar 17-**88**; the principles and devel., Dickerson * Feb 23-**89**; manage-

Engines

ment * Apr 26; 100 h.p., for elec. lighting, Berlin * May 17-**90**; the builders of, Thurston, May 16, 23-**91**; theory of *The Eng* July 6, 20; Nottingham Show, July 13-**88**; Cotterill, bk. review, Dec 26-**90**. See also AMMONIA — ETHER — HOT air — MARINE—MILL — PETROLEUM — PUMPING — ROAD — ROLLING mill—ROTARY—TRACTION—WINDING—engines; LOCOM.

AIR pumps and condensers, Towler *The Eng* * Apr 29 * May 13 -**92**

AM. high speed *El Rev* * Mar 5, *E & Min* * Mar 5, *Pwr* * Mar -**92**. See also ENGINES, high speed

BEAM, Whitbread brewery, Boulton & Watt, 1785 *Eng* * July 27 -**88**

BELGIAN, inset *The Eng* * Jan 16, 16-**91**

BRAKE, the Appold, expts. *The Eng* Jan 13, 20-**88**, Dec 2-**87**, Schonheyder, cor. *Eng* July 28-**76**

BREAKDOWNS, Sweet *Cassier's* Nov -**91**

BURGIN high speed *R & Eng* * Jan -**90**

COLLIERY, econom. use of steam in, McLaren, trials *The Eng* July 17-**91**

COMPOUND *Am M E* performance of a, Barrus, * v 9 -**88**; use of for manuf., Main * v 10; cyl. ratios of triple-expansion, Whitham * v 10 -**89**; philosophy of the multi-cyl. engine and its limitations, Thurston, v 11 -**90**; single-acting, Bole * v 12; test of a trip-expan., Henthorn * v 12; applic. of Hirn's anal. to multiple-expan., Peabody, v 12 -**91**; two-cyl. vs. multi-cyl. engines, Green-Rockwood * v 13; steam distrib. in single-acting, Rites * v 13 -**92**

Cassier's philos. of multi-cyl., Thurston, Nov; trip-expan., effect of compression on shaft friction, Alden * Nov -**91**; trip-expan. experimental, Peabody * Mar; tandem, New Haven Elec. L. Co. * Apr; steam distrib. in single-acting, Rites * May: with Proell valve gear * Aug -**92**; Strong trip-expan. (vertical) *El Eng* * Sep 28, do. *El Rev* * Oct 15-**92**; Jonson's stationary (vertical) *El Wld* * Sep 7-**89**; the Triumph * Feb 15-**90**

Eng Guinness grain stores. inset * Feb 3; and non-compound, steam consumption of, trial, Willans, Mar 16; hor., Glasgow exhib. * Nov 9; hor., Whitbread brewery, inset * 30-**88**; vertical, valve gear * May 31; hor., Sulzer, Paris exhib. July 26, inset * Oct 11; tandem, Frikart system, do., inset * Aug 23, hor., inset * Sep 6, 6, inset * Nov 22-**89**; Corlis hor. do. *

Engines, COMPOUND

Feb 14, trip-expan. hor. do. * Apr 4, 11; Lyon's slide valve * May 16; hor., Frikart valve gear, inset * June 20–**90**; Kaiser-I-Huid cotton mills, Bombay, inset * May 8; trip-expan. experimental, Allis * Aug 14–**91**; 1600 I. h.p. tandem, inset * Nov 25 –**92**

E News non-condens., steam consumption of simple and, Williams, May 5; Westinghouse aut. * 5–**88**; Jonson's balanced * May 4–**89**; Strong's 250 h.p. trip-expan. vertical * Sep 22; steam distrib. in single-acting, Rites * Oct 20–**92**

F Inst philos. of, Thurston, Dec –**89**, of multi-cyl., do. Jan * Feb –**90**; the Triumph *Pwr* * Mar –**90**; trip-expan. vertical * Mar –**91**; Strong's do. * Oct –**92**; the Woolf *R & Eng* * Apr –**88**; Willan's trip-expan. * Aug –**89**, do. central valve *Sc Am Sup* Jan 19–**89**; quad-expan. mill * Dec –**92**; Westinghouse *R Gaz* * May 4–**88**; steam distrib. in, Rites * May 27–**92**; trip-expan. experimental, Peabody, Hirn's anal. *Tech Q* * Oct –**91**

The Eng 200 h.p. hor., Crompton, Jan 20; portable self-propelling, Cooper, Apr 27; hor., Glasgow exhib. May 4, 4; trunk air-pump, str. Hector, June 8; a new tandem, Turner, July 20, 20; triple semi-port., Nottingham Show, 27; 800 h.p. tandem, with Proell gear, Sep 7, 7; Willan's trip-expan. central valve, Dec 14–**88**; 400 h.p. condensing, Brussels exhib. * Feb 22; 350 h.p. Carel's, July 5; trip-expan., with Corliss gear, 26; tandem, Berlin elec. station, Sep 6; the Globe * Nov 29; 400 h.p. Sulzer * Dec 6–**89**

The Eng trip-expan French, Paris exhib. * Jan 10, 10; Fives-Lille condens., do. * Mar 14, 14; str. Hercules, 1830, inset * Mar 21 * Apr 11, gear * May 2; and trip-expan., ed. 9; Watt's, 1829 * June 27; 250 h.p. vertical * Aug 22, 22; 2000 h.p. condens. * Oct 3–**90**; trip-expan. vertical condens. for elec. lighting, inset * Feb 6, 6; Corliss mill * Mar 13, 27; 1000 h.p. trip-expan. mill * Aug 7–**91**; 1000 I. h.p. do. Indian Midland R. * Aug 26–**92**. See also AIR compressing — BLOWING — MARINE — PUMPING engines, etc.

COMPOUNDING centrif. and load governing by rotary piston valve, Aldrich *Am M E* –**92**

CONDENSERS, Kinealy *Sc Am Sup* Mar 16–**89**, *J Assoc E Socs.* See also CONDENSERS

CONNECTING rods, Mattes *Am M E* * v 9 –**88**. See also LOCOMOTIVES, conn. rods

Engines, CORLISS econ. of compound and single cyl., Jacobus *Am M E* * v 12 -**91**; cut-off and compression in, Stanwood *Cassier's* * Jan; valves adjusting, Pray * Feb -**92**; 2500 h.p. mill *Eng* * Mar 23, inset * Apr 6, 6; hor., inset * Apr 20-**88** * Jan -**89**; hor., Paris exhib. * Feb 14-**90**; cut-off and compression, extending range of, Stanwood * Dec 18-**91**; with non-detaching gear * Aug 26-**92**

CRANK pins, method of securing, Collins *Am M E* -**88**; crank device, Micheles *Eng* * July 10-**91**; crank angle for max. vel. of piston * July 15-**92**

CYLINDER condensation, of steam in, surface condensers, Whitham *Am M E* -**88**; effect of steam jacket on, Bird * v 12-**91**; thermo-elec. method of studying, Hall *El Eng* * June 24, do. *El Rev Lond* * July 3, do. *El Rev* * June 27, do. *El Wld* * June 20-**91**; Conover condenser *El Rev* * July 30-**92**; condensers, theory, Dwels.-Dery *Eng* Sep 13; action of steam in, expts., English * Nov 8, 15-**89**

Inst C E glass ap. for rendering visible effects of, Donkin, abs. v 97 -**89**; *Bul Soc Mul* -**89**; heat expenditure, the cyl. heated externally by gas-flames, Donkin, expts., inset, do. Dwels.-Dery, Unwin trans. (full) *Inst C E* * v 98 -**89**; cyl. walls temp. taking at different depths in the metal, Donkin * v 100 -**90**; thermal action of cyl. walls, Dwels.-Dery, abs. v 103 -**91**, *Bul Soc Mul* Aug, Sep -**90**; movement of heat in, Kusch, abs. *Inst C E* v 107 -**92**, *Zeit deut Ing* -**91**; and re-evap., expts., English, insets (full) *Inst M E* * Oct -**89**, initial condens., during admission, do. May -**92**; thermo-elec. method of studying, Hall, *R & Eng* * Feb -**92**, *Am Inst Elec Engrs*

The Eng ed. Dec 21-**88**; theories of, ed. Mar 8; Donkin's co-efficient, ed. 29; and re-evap. in jacketted cyl., expts., English * Nov 8-**89**; cyl. walls temp. cal., Donkin, diags. * Sep 25 * Oct 9; thermo-elec. method of studying, Fitz-Gerald * Oct 16 -**91**; expts., Donkin, ed. July 15; Dwels.-Dery, cor. Aug 26, Sep 2-**92**

CYLINDERS, proportioning, Thurston *Am M E* v 9 -**88**; two cyls. vs. multi-cyl. engines, Green & Rockwood -**92**; deposits anal., Stillman *Cassier's* Nov -**92**; action of steam in, expts., English *Eng* * Nov 8, 15-**89**; expts. on temp. of metal, Donkin, inset *Inst C E* * v 106 -**91**. See also ENGINES, cyl. condensation

DIRECT connected, Werner *Cassier's* * June - Sep -**92**

Engines, DODD'S high-speed *Eng* * Oct 5-**88**
ECLIPSE Corliss, Frick Co. *The Eng* Mar 30-**88**
EFFICIENCY, the ideal compared with the real, Thurston *E News* * July 4, do. *Am M E* * v 12 -**91**; and econ. of, Peabody * v 13 -**92**; Dwels.-Dery *Eng* Feb 21; standard, Bodmer, Mar 7, do. Elliott, cor. 21-**90**; *Locom* Dec -**88**; Dery, cor. *The Eng* Oct 25, cor. Nov 1-**89**; standard of * Feb 7, 21, Mar 14, Apr 25-**90**
ERIE City aut. cut-off *Pwr* * May, *R & Eng* * May -**88**
EXPERIMENTS. See ENGINES, tests and trials
FISHKILL Corliss, with Cite's releasing valve gear *Pwr* Aug -**88** * Aug -**90**
FLY-wheel, novel, Manning *Am M E* * v 13 -**92**; and govs., Dwels.-Dery, Donkin *Inst C E* * v 104 -**91**, do., Ransom, insets * v 109-**92**; breakage at Amoskeag mills, Manchester, N. H. *Pwr* * Nov * Dec -**91**
FOUNDATIONS *Pwr* * Apr * May -**91**
FRICTION, internal, of non-condensing, Thurston *Am M E* * v 9 -**88**, abs. *Inst C E* v 92 -**88** *E News* May 26-**88**; speed and work, variable load and internal friction, do. *Am M E* * 10-**89**, expts. *R Gaz* * Dec 28, (full) *Sc Am Sup* * Oct 27 * Nov 3-**88**; distrib. of internal, do. *Am M E* v 10 -**89** *Eng* * Jan 4-18-**89** *F Inst* * Nov, (full) *Sc Am Sup* Nov 10, 17-**88**; of slide valves, ap. for testing, Aspinall *The Eng* * Mar 22-**89**
GOVERNORS, J. M. Smith, a use for inertia in shaft govs., Armstrong *Am M E* * v 11 -**90**, do. *E News* * July 19-**90**; governing of engines, Aldrich *Cassier's* Sep -**92**; Wilby supplementary *Eng* * Apr 20-**88**; action, new method of investigation, Dwelshauvers-Dery, Longridge, trans. *Inst C E* * v 94 -**88** * v 110 -**92**; speed regulators, Marie abs. v 93 -**88** *An Mines* * 12 -**87**; the Westinghouse *R & Eng* * July -**91**; Tyrrel's *The Eng* Dec 28-**88**; Nadberg's aut. cut-off * Sep 18-**91**
GRABNER'S, combined piston and valve *E News* * Oct 26-**89**
HIGH-speed, comparative fuel econ. of, Barius, etc., discuss. *Am M E* v 9-**88**; high and low speed, Church, Powers *El Rev Lond* Aug 17, *El Eng* Apr 13-**88**; P. Atkinson *Lehigh Eng J* Feb -**89**; Rigg's revolving *The Eng* Jan 27-**88**
HISTORY, early *Cassier's* * Nov -**91**; 50 years ago, number, etc., ed. *R & Eng* July -**88**
INDICATOR diagram, Emery *Am M E* * v 9-**88**; motion device, Jacobi * v 10 -**89**; rigging for compound engines, Par-

Engines, INDICATOR
sons, length of card, Webb, the comparison of indicators, do. * v 11 -**90**; the Tabor *Eng* * June 7-**89**; errors of *E News* * Feb 9-**89**; the Perry * Sep 5-**91**
Pwr indicating * Aug - Oct -**88** * June - Aug * Nov -**89**, comparison, Webb * Jan, Feb -**90**; files to * Dec -**92**; Bagshaw's diagram meter *The Eng* Aug 24-**88**; the Tabor, July 19; combined diags., Gill, cor. Aug 23, Campbell, 30 * Oct 11-**89**. See also INDICATORS, continuous, etc.
KIMBLE, the *The Eng* * Oct 2-**91** *Pwr*
LIDBACK'S vibrating *F Inst* Oct -**88**
LYON'S compound slide valve *Eng* * May 16-**90**
MCEWEN aut. *El Wld* * Apr 16-**92**
MOTOR, an alleged new, Lautreppe *E News* Jan 7-**88**
NOBLE'S vertical *The Eng* * June 20-**90**
PHILADELPHIA Corliss *Pwr* * Jan -**92**
PISTON packing, new principle in, Sweet *Am M E* * v 9 -**88**; friction of packing rings, Denton * v 10 -**89**; rod packings *Pwr* * Jan -**88**; rod breakages, report *R & Eng* * Nov -**90**
PORTABLE, with removable fire-box and tubes *Eng* * May 10-**89**; semi-portable trip-expan. *E News* * Aug 11-**88**; how erected *The Eng* * Sep 11-**91**
PYLE aut. and dynamo (multiple cyl.) *El Wld* * Aug 29-**91**
RIGG'S high-speed revolving *The Eng* Jan 27-**88**
ROBB-Armstrong, n *E & Min* * Sep 10-**92**
SHIPMAN aut. *The Eng* July 27-**88**
SLIDE valve diagrams, Thallmayer, cor. *Eng* * Mar 15-**89**; balanced slide valves, Park, inset *Inst C E* * v 98-**89**; Ætna balanced *Pwr* * Oct -**90**; friction of, ap. for testing, Aspinall *The Eng* * Mar 22-**89**. See also ENGINES, valve gears
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STEAM jacket, authorities on, Thurston *Am M E* v 12 -**91**, do. Donkin *Inst C E* v 104 -**91**; influence of, Kent *Cassier's* * Dec -**91**; Dwels-Dery *Eng* Dec 13-**89**; econ., notes from an

Engines, STEAM jacket
eng. lab. Dec 25-**91**; value, com. report, Oct 28, Davey, 28, Nov 4, expts. * Dec 9-23-**92**, do. (full) *Inst M E* Oct -**89**; max. effic., Thurston *F Inst* * Apr -**91**; effic., ed. *The Eng* Nov 28-**90**; value, com. report, Oct 28-**92**.
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STRONG'S trip-expan. vertical *El Eng* * Sep 28, *El Rev* * Oct 15, 250 h. p. *E News* * Sep 22, *Pwr* * Oct -**92**
SULZER, Brussels exhib. *The Eng* Aug 17-**88**
TESTS and trials *Am M E* of several types, Carpenter * v 11-**90**; compound trip-expan., Henthorn * v 12; applics. of Hirn's anal. to, Carpenter * v 12 -**91**; testing, Ihlseng *Cassier's* * Apr; compound multi-cyl., Green * May -**92**
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E News several types, Carpenter, table, Aug 2-**90**; econ. of non-condensing, simple, compound and triple, Willans, and discuss., insets (very full) *Inst C E* * v 93 -**88**, reply to cor. * v 96, Westinghouse test, Alley, n v 96 -**89**; at Whitworth eng. lab., Manchester, Reynolds, and discuss., inset (full) * v 99 -**90**
Pwr compound, Howland mill, New Bedford, Mass. (full) * Dec -**89**; Utica, N. Y. Steam Cotton mills power plant, Carpenter * Aug -**92**; econ. of non-condens., Willans *R Gaz* Aug 6 -**88**; expts. at Mass. Inst. Tech., Purinton, general review of tests, Peabody (full) *Soc Arts Mass* -**88**; Purinton *Tech Q* * Feb -**88**
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THREE-cylinder, Paris exhib. *Eng* July 12-**89**
UNDERGROUND hauling, Ilkeston colliery *Eng* * Nov 23-**88**
VALVE gears, effect of unbalanced eccen. or gov. ball on valve motion, Sweet *Am M E* * v 11 -**90**; Proell gear on compound *Cassier's* * Aug -**92**
Eng Payton's * Aug 17-**88**; compound vertical * May 31;

Engines, VALVE gears
hor. engine with Wheelock gear, Paris exhib., inset * Aug 9; Bremmes' * Oct 11; radial gears, J. R. Smith * Nov 22, 29-**89**; radial gears, Payton, cor. * Jan 24; Bremme's, cor. * 24; Frikart gear, comp. hor., inset * June 20-**90**; Walker's Corliss, n * July 24-**91**; the Zenner valve motion diag. Gow *F Inst* Sep -**88**; prob., graphic solution, Weihe *Lehigh Eng J* Apr -**89** *Pwr* Fishkill Corliss with Cite's releasing gear * Aug -**88** * Aug -**90**; link motion, Lyne * Apr, June -**89**; Corliss valves setting * Mar -**90** * Nov -**92**; valves * June -**90**; Child's piston valve *R & Eng* * Jan -**89**; radial gears, J. R. Smith * Feb * Mar, Morton radial * May -**90**; valves, Hawley *Sc Am Sup* * Jan 31 * Feb 14-**91**; Proell gear, 800 h. p. tandem comp. *The Eng* Sep 7, 7-**88**; the Cross gear * Apr 4-**90.** See also ENGINES, slide valves.
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English notes *E & Min* Aug 24, 31, Sep 14, 21, Oct 12, Nov. 23-**89.** See also GREAT Britain
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Esparto. See PAPER, Esparto (fibre)
Estridge, Joseph *Inst C E* v 106 -**91**
Ether, elec. and ponderable matter, W. Thompson (full) *El Wld* * Apr 27-**89**; first capital operation, Slade *Scribner's* Oct -**92**
Ether engine, Susini's *Sc Am Sup* * Nov 14-**91**
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Etna, volcanic eruption *Sc Am Sup* Aug 27-**92**

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PARIS, notes *El Wld* Oct 5, 12-**89**, ed. *Eng* * Apr 27, May 11, inset * June 1, 29, ed. July 27 * Aug 10, 31, ed. Sep 28 * Nov 2-

Exhibitions, PARIS

30 * Dec 14-**88** * Jan 4, 25 * Feb 1, inset (full) * May 3, ed. 10, 17, 24, * June 7, 7, means of transport * July 5-26 * Aug 2, 16, 23 * Sep 6, 13, 27, awards, Oct 4, 11, stats. 18, ed. Nov 8, 15, Wood, cor. Dec 13-**89,** diplomas * Jan 9-**91,** *E & Min* * May 18 * June 1-**89,** *Genie Civil,* U. S. elec. exhibits, Hering *F Inst* Jan, May, June, metallur. arts at, Garrison, May, June * July, Aug * Oct -**90**; 1889, Machin. Hall erection, Henard, abs. *Inst C E* v 95 -**89** *Genie Civil* * v 13 -**88,** *R Gaz* May 17-**89,** *Sci Am* Feb 2, 2, Apr 20-**89**; 1889 *Sc Am Sup* * Aug 4-**88** * Feb 16 * Mar 30 * Apr 27 * May 25 * June 8, 15 * July 13 * Aug 17 * Oct 12, 26, awards, Nov 2, 9-**89,** *The Eng* Dec 28, 28-**88** * May 3, Eiffel tower * 10, 17, June 14 * Aug 2-16, awards, Oct 4-**89**

TASMANIA *Eng* Feb 6-**91**

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El Eng electricity at, Calkins * Nov 23-**92**; *El Wld* Electric. bld. plan (large scale) * Oct 24-**91,** electric. at * Aug, Sep, Machin. bld. * Oct 1, electric. at * Dec 3-**92**

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Exhibitions, U. S., World's Columbian
bld. inset * May 5, 12, 26, June 9, Mach. bld. inset * 30 * July 7, inset, 28, inset * Sep 1, 8, transportation * Oct 13, elec. R., inset * 20, cars, inset * Nov 17, Transport. bld. Dec 1, inset * 29-**92**

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The Eng * July 31 * Aug 14 * Sep 18, battleship Oct 16, regulations 16 * 23 * Nov 6, 13, 20, 27, 27 * Dec 25-**91** * July 1, 22 * Aug 12 * Sep 9, 23, general plan * Oct 28-**92**

Explosions from unknown causes, Bayles *Am Min* v 19-**91**, do. Green, v 20 -**92**; under water *Eng* * Mar 22-**89**; of dynamite on the schooner Parallel, Le Conte *R Gaz* Aug 2-**88**. See also BOILERS, explosions, etc.

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AZOIMIDE (new sodium salt) *Sc Am Sup* Jan 9-**92**
BELLITE, expts. *Eng* Feb 8-**89**; *E & Min* Dec 1-**88**, *Iron;* Favier and Roburite *E News* Apr 25-**91**; Chalon, abs. *Inst C E* v 94 -**88**, *Genie Civil* v 13 -**88**; *Locom* Mar **89**; *Sci Am* Dec 1-**88**; *The Eng* Nov 9-**88**; expts. Feb 8-**89**
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CARBO-dynamite *Eng* Apr 20, *Sc Am Sup* May 19-**88**
EMMENSITE *E News* Feb 2-**89**, n *Sc Am Sup* Jan 7-**88**, *Am Engr*
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GUN-powder, blasting, form of crater produced by exploding in a homogeneous solid, Firmstone, insets *Am Min* * 18-**90**; smokeless *E & Min* July 5-**90**, *Industries*, do. *E News* July 5-**90**, do. expts. at Essen, abs. *Inst C E* v 100 -**90**; manuf., F. H. Robinson *Sc Am Sup* Dec 1-**88**; improvements in, Abel (full) Oct 18-**90**; smokeless, do. (full) Apr 12 * June 28, do., Helene (full) * Oct 4-**90**, do. Maxim (full) Sep 26-**91**
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NITRO-glycerine and other, tests of relative strength, F. W. Clark *Am Min* * v 18 -**90**; manuf., Vuillaume *Sc Am Sup* * Apr 13 -**89**
ROBURITE, Favier and Bellite *E News* Apr 25-**91**
SMOKELESS powders. See EXPLOSIVES, gun-powders, smokeless
Extensometer, Johnson's *E News* * Aug 4-**92**
Extract concentrating ap. in vacuo, Adrian *Sc Am Sup* * May 25-**89**
Eye-bars, steel, tests, Lewis, discuss. *Am C E* * v 27-**92**; tests of full size, n *E News* * July 14-**92**
Eyesight, care of, Fox *F Inst* Sep -**91**, June -**92**, do. (full) *Sc Am Sup* Oct 3-**91**

Factory, elec. driving (full) *The Eng* Nov 25-**92**. See also MILLS
Falling bodies vel., of different spec. grav. falling in water, Richards-Woodward, insets *Am Min* * v 18 -**90**, do. insets *Tech Q* * May -**90**
Falshaw, James (full) *Inst C E* v 99 -**90**

Fans, Walker anti-vibration reg. shutter or slide for, Guibal, and other enclosed fans, Walker *Am Min* v 19 -**91**; Capell, at Berge-Borbeck, Kattwinkel, abs. *Inst C E* v 103 -**91**, *Zeit Berg* -**90**. See also BLOWERS

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Farrar, James *Inst C E* v 98 -**89**

Faucet, an indestructible, W. Thomson's *E News* * Sep 19-**91**

Feed water heaters. See BOILERS, feed water heaters

Felton, Samuel M. *R Gaz* Feb 1-**89**

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Ferranti and his work *El Wld* * Jan 2-**92**

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Ferry-boats, the 'Bergen' steam double screw str., Hoboken, Stevens-Denton *Am M E* * v 11; *Eng* * Feb 21, 21; performance, do. *R & Eng* Mar -**90**; *R Gaz* * Aug 9-**89**; *Sci Am* Dec 8 -**88**; *Sc Am Sup* * Nov 1-**90**

BREMEN, screw *Eng* * Feb -**92**

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HOBOKEN, Gannon *R & Eng* * Feb -**92**. See also Ferry-boats, 'Bergen'

'MERSEY' str., Liverpool *The Eng* * Oct 23-**91**

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Fertilizers, trade report, Terne *F Inst* Dec -**92**; relation to

Fertilizers
fruits, Austen *Sc Am Sup* May 25-**89**; fertilizing materials, Voorhees, May 3-**90**; (full) June 13-**91**; artif, W. S. Allen *Soc Arts Mass* -**89**

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Fire alarms, Denio system *El Eng* * Oct 5-**92**; the Rogers auxil. *El Wld* * Oct 13-**88**; Gaynor system * May 11-**89**; N. Y. service, n * Nov 28-**91**

Fire-boats, N. Y. city *E & Min* Apr 12-**90**; Cowles, abs. *Inst C E* v 92 -**88**, *Am M E* -**87**, for City of Chic., do. *The Eng* Dec 21-**88**

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Fire extinguishers, Lufkin's elec. method *El Eng* * Sep 3-**90**; Carver's ap. July 7 * Sep 7-**88** * Feb 15-**89**; water required, ed. Dec 20-**90**, do. *E Rec* Jan 10-**91**; extinguishing, Woodbury, cor. *E News* Jan 11-**90**; Hexamer's, for malt mills, com. report, n *F Inst* Apr -**89**; Mackey aut. *Sci Am* Nov 3-**88**; Met. fire brigade, Lond. *The Eng* Feb 3; Douse's aut. fire-check, Nov 23-**88**

HOSE, linen, quality of *E News* Mar 23-**89**. See also FIRE streams

HYDRANTS, det. of rental value of, Tubbs *E News* May 5-**88**; and valves, new types, Stillwell manuf. Co. * Mar 29; Eddy Valve Co. * Oct 4-**90**

Fire INSURANCE and elec. interests, relations between, Barton *El Eng* May 28, do. *El Wld* May 31; Assoc., Factory Mut. results *E News* Sep 22-**88**; Bost. Manuf's. Mut. Co's report, n Mar 23-**89**; rules and elec. lighting, Hartwell *The Eng* Dec 5-**90**. See also ELEC. insurance, etc.

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LONDON stats. *El Rev Lond* Jan 18-**89**; and fire telegraphs, Feb 5-**92**; Met. fire brigade *The Eng* Feb 3-**88**

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Fishery question, No. Am., Linzee *Tech Q* Feb -**90**
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Fleming, John A., por *El Wld* * Nov 8-**90**
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Floods, Ravine du Sud, Hayti, averting overflow, Crowell, and discuss., insets, So. Fork dam failure, com. report, insets *Am C E* * v 24 -**91**; effects in western rivers, Going *E Mag* Sep -**92** *E News* through the failure of natural barriers, July 27; Johnstown, Pa., disaster * June 1, ed. 8, and South Fork dam,

Floods
and ed. 15, 15, ed. 22; map of district * July 13 * Aug 17-**89**; of June, 1889, West branch Susquehanna river, Pa. * Feb 14-**91**, do. report, Raymond *E Rec* Jan 23-**92**; Johnstown * June -**89**; in Germany, causes of, Niles *Soc Arts Mass* -**88**; prevention and control of rivers, Robbins *Tech Q* Sep -**87**; discharge from small watersheds, Porter, inset * Dec -**91**; Johnstown *The Eng* Aug 30-**89**

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Fraser, Henry J. *Inst C E* v 100 -**90**

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CALORIMETERS for testing. See CALORIMETERS

CULM compared with other *E News* Dec 6–**90**

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HEATING, Nicholson *Am M E* * v 11 -**90**; and melting, machin. for charging, Wellman, insets *Am Min* * v 19 -**91**; Siemans, Smith *E News* * May 24-**90**; for re-heating steel plates, using re-generated producer gas, Loomis proc. * Oct 11-**90**

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LIQUID fuel burning *The Eng* Feb 10, 24, Mar 9, 23, Apr 20, construct. June 8, July 13, Oct 19-**88**

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Galwey, William St. John (full) *Inst C E* v 109 -**92**
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BUENOS AYRES supply, Stevenson *Inst C E* v 103 -**91**
BUOY, steel *The Eng* Sep 13-**89**
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COQUEREL plant, Vitoux, abs. *Inst C E* v 105 -**91** *Genie Civil* * v 19 -**91**
ENGINES, duplex, Sperry *El Eng* * Sep 17, do. *El Rev* * Sep 20, do. *El Wld* * Sep 20, do. *E & Min* * Sep 20-**90**; Crystal Pal. Elec. exhib. *El Rev Lond* * Feb 12, 19 * Mar 14-**92**; oil and steam engines *Eng* June 26; 30 h.p., Frankfort Elec. exhib. * July 3, 25 h.p. do. * Nov 13; 16 h.p. * July 31-**91**; econ., ed. Feb 12-**92,** do. n *E Mag* July -**91**
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The Eng Nottingham Show, July 13: regenerative, Nov 9 -**88**; combustion in, Ebbs * June 28-**89**; 100 h.p., Paris exhib. * Jan 10; effic. of, Miller * June 13 * July 25, Aug 29-**90**; Crystal Pal. exhib. * June 3-**92**
ACME, M'Ghee & Burt's *The Eng* * Apr 4-**90**

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ATKINSON'S cycle *El Wld* * June 6-**91**, 6 h.p. *Eng* * Dec 28 -**88** * Feb 22, com. report *F Inst* * June -**89**, *Pwr* * June -**91**, 6 h.p. and pump *Sc Am Sup* * Feb 9-**89**, * June 27, *St R J* * June, *The Eng* * July 3-**91**
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CHARTER, the *Eng* * Feb 10-**88**
CYCLE, the, Ransom, insets *Inst C E* * v 109 -**92**. See also GAS engines, Atkinson's
FORWARD, the *Eng* * Mar 8, 8, *The Eng* * Apr 5-**89** * July 11 -**90** * Aug 21-**91**
GRIFFIN, the *Eng* * Apr 13, June 1, *The Eng* May 18, 25, June 1-**88**
OTTO, test, Kidwell *F Inst* Feb, Spangler, abs. *Inst C E* v 100 -**90**
PALATINE *The Eng* * Dec 30-**92**
ROBEY'S *The Eng* * Oct 14-**92**
ROLLASON, the *Pwr* * Oct -**91**
ROOT'S *Eng* * Feb 5-**92**
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SINTZ, the *El Wld* * Dec 5, *Pwr* * Dec -**91**
SPERRY'S duplex *El Eng* * Sep 17, *El Rev* * Sep 20, *El Wld* * Sep 20, *E & Min* * Sep 20-**90**
STURGEON, the *The Eng* June 15-**88**
TRUSTY, the, Wehman's *The Eng* * Oct 2-**91**
FUEL-gas, notes, Goetz *Am Min* * v 18 -**90**; Loomis proc., Oakman *Eng* Aug 1 * 22, do. gen. plant *E News* * Oct 11, do., insets *Inst M E* * July -**90**, and applics., do. *Sc Am Sup* * Nov 1-**90**; furnace, Archer combination *E & Min* * Mar 1, June 14-**90**; manuf. fuel-gas for heating, Christian, and ed. *E News* May 30, 30-**91**; production, Kitson's method * May 26-**92**, do. *F Inst* Dec -**91**; impracticability of util. coal gas for fuel, Merkle *Lehigh Eng J* Apr, expts. with mixture of three gases, do. June -**89**; and incand. gas lighting, Lungren *Sc Am Sup* Mar 3-**88**, *Light, Heat and Power*

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LEAKAGE, Nettleton *Sc Am Sup* Dec 5-**91**

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LONDON, and coal trade of, ed. *The Eng* Sep 20-**89**

LOOMIS proc., gen. plant, Oakman *Eng* * Aug 1, 22, *E News* * Oct 11, insets *Inst M E* * July -**90**, and applics. *Sc Am Sup* * Nov 1-**90**

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NATURAL, and petrol. in N. Y. State, Ashburner, inset maps (full) *Am Min* * v 16 -**88**, explorations along Niagara river and geol. of Buffalo, do. v 17 -**89**, explors. in eastern Ontario Peninsula, do. * v 18 -**90**, do. *E & Min* Mar 15-**90**; Mc Sweeney regen. puddling furnace for * Apr 20-**89**; measurement with Pitot tube gauge, S. W. Robinson * Feb 28-**91**; fields, Pitts., geol. of, Cummins, July 30-**92**; and oil, ed. *E News* Apr 14-**88**; Pitts., past and present, Mar 30-**89**; *E Rec* Dec 6 -**90**; industry, Pitts., Pa. *Sc Am Sup* * Jan 1; Philipp, June 9; Norton *Soc Arts Mass* -**88**

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PHILADELPHIA City works *E News* Apr 14-**88**
PIPE, submerged, Grand Forks, So. Dak. *E News* * May 5-**92**
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RETORTS, aut. *Sc Am Sup* * July 19-**90**; contin. feed and discharge, Haig * Jan 24-**91**
STOVES and burners, unburned gases in flue gases from, W. Thomson *Sc Am Sup* Dec 20, *The Eng* Oct 10-**90**
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Gaseous illuminants, Lewes (full) *Sc Am Sup* Mar 7-28-**91**, *J Soc Arts Lond.* See also FLAME; LIGHT
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Gearing

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Gillham, Francis *Inst C E* v 110 -**92**

Gilsonite, spec. from Uintah Cty., Utah, Raymond *Am Min* v 17 -**89**

Girder, continuous, Lindenberger *F Inst* * Jan, Mar -**91.** See also BEAMS and girders

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Gold

cuss., inset (very full) *Inst C E* * v 108 -**92**; and silver produc. in U. S., '88 *Locom* June -**89**

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FIELDS, Dekaap, in the Transvaal, notes on geol. of, Furlonge, inset *Am Min* * v 18 -**90**; the Bendigo gold-field, Rickard (very full), n p 772 * v 20 -**92**; Queensland, *Eng* Jan 22, Feb 19, 26, Mar 4-**92**; of So. Africa, Halle *E Mag* * Feb insets * July; Ecuador, Lord, May; of Bendigo, Austral., Markes, insets * Dec -**92**; So. Africa *E & Min* Jan 5; Transvaal, do. May 4; the Southern (U. S.), Hand, 18-**89**; Dekaap, Transvaal, note on geol. of, Furlonge * Mar 8-**90**. See also GOLD mines, Victoria

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CERRO de Pasco mining plant stamp mill, Transvaal *The Eng* * Feb 15-**89**

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MT. Morgan mine, Queensland, Rickard, *Am Min* * v 20 -**92**, *E & Min* * Aug 22, 29-**91**

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Gooch, Daniel *The Eng* Oct 18-**89**
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Grates. See FURNACES, grates

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Gunnery

* Oct 18; armament, new features (high angle fire) * Nov 22-**90**; mod. ar., Brainard * May 23-**91**

The Eng penetration of ar. plates, cal. of trajectories, May 11, 11; Krupp's projectiles and Brit. steel-faced plates, July 13; French and Ital. ar. tests, Nov 16; Gruson's armored carriages, Schumann, Dec 7, 7; ar. lead tempering, Lisbonne, June 1-**88**, *Genie Civil*

The Eng, the Graydon shell * Feb 22; ar. for ships, Barnaby * Apr 12; compound ar. and steel, Schneider, July 12, 12; Dutch ar. trials * Nov 22-**89**; artillery expts. at Buckau * Sep 26 * Oct 3; steel-faced ar., St. Petersburg trial * Nov 21-**90**

The Eng Russian ar. trials * Jan 9; deck ar., for vertical fire, expts., Japan * June 5; Bethlehem steel ar., after test * Aug 28; Royal ordnance factories, constitution of, Great Brit. Oct 9; ar. trials at Shoeburyness * Nov 6, at Portsmouth, England * Nov 13-**91**

The Eng Harvey nickel ar. trial * Aug 19; ar., recent prog. * Sep 16; Vickers Harvey ar. * Dec 16; German and French imitation cupolas and shields * 23-**92**; gunnery questions, how settled by cal. July 27, Sep 28, Dec 21-**88**, Jan 11, Aug 16, 23-**89**, Feb 14 * Mar 14-**90**

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Guns

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BOFORS cast steel, Michaelis *Am Min* v 16 –**88**, *Sc Am Sup* Sep 15–**88**

BROWN segmental wire-wound *E News* * Nov 24–**92**, *Sc Am Sup* *Jan 11–**90**, Wittman *Dec 24, *The Eng* * Nov 11–**92**, *Am Min*

CANET quick firing, with elec. training gear *El Rev* * Sep 27–**90**; 66-ton, test *Eng* Feb 27, Sep 4; vs. Krupp, Dec 25–**91**, Jan 1, 15–29, Feb 5, Apr 1, May 20, June 3, 10–**92**; large, for Japan *E News* * Jan 30; and ar. trials *Sc Am Sup* * Jan 16, 16–**92**; *The Eng* * June 12 * Dec 11–**91**

CANNON, mod. high power rifled, development, Califf (full) *R & Eng* * Jan * Feb, Apr — * Oct –**89**

COLT'S navy revolver, com. report *F Inst* * May –**90**

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FIELD, and mountain, Armstrong *Eng* * Dec 6–**89**; Russian field and coast *Sc Am Sup* * Sep 1–**88**, *The Eng*

FRENCH artillery, insets (full) *Eng* * Jan 3–**90** — Apr 24–**91**; quick firing, ed. Aug 12–**92**; mod. *Sc Am Sup* * July 19–**90**

GERMAN magazine rifle *Eng* * May 15, new *Sc Am Sup* * Jan 3–**91**

GIFFORD liquid-gas *E News* * Aug 9, carb. acid *Sc Am Sup* * Aug 30–**90**

GRUSON'S quick fire *R & Eng* * Apr, *The Eng* * Jan 10–**90**

Guns, HOTCHKISS ordnance *Sc Am Sup* * July 13–**89,** revolving cannon * Mar 7–**91,** *Eng;* Paris exhib. *The Eng* * June 7–**89**
HOWITZER, 11-in., Armstrong *Eng* * Jan 6–**88**; cast iron, Spain * Mar 11–**92**; high angle battery *The Eng* * July 18–**90**
KRAG-Jorgensen repeating rifle *E News* * Oct 6, *R & Eng* * Oct –**92**
LEBEL magazine rifle *Sci Am* Oct 27, *The Eng* Sep 28, 28–**88**
LONGRIDGE, the *Eng* * May 4, 11, *The Eng* May 11–**88**
MACHINE, Miller's aut. indicator for *Sci Am* Mar 9–**89**
MAGAZINE rifles, rifle-mark, ed. *Eng* * Feb 6; the Mannlicher (our new) * Mar 6; the Mauser * Apr 3; Swiss * Oct 2; Rees' * Nov 27–**91**; new *Sc Am Sup* Apr 5–**90**; mag. guns development, A. Russell * *Soc Arts Mass* –**90**; *The Eng* * Apr 4–**90**; new * Feb 6; small arms, tests, N. Y. * Sep 4–**91**
MAXIM aut. machine, inset *Eng* * Jan 27; 3-pounder * June 22–**88**; * Oct 9, 16–**91**; *Sci Am* Feb 16–**89**; *Sc Am Sup* * July 7, *The Eng* June 1–**88**
MORTARS, U. S. cast iron coast *Eng* * Mar 18, 25 * Apr 1–22, do. 12-in. breach-loading rifled *E News* * Dec 8, *R & Eng* * Dec –**92**; 12-in. manuf., Fuller, Connet *Sc Am Sup* * Sep 6–**90** * Jan 17–**91,** *Steven's Indic;* 12-in. rifled, S. Mansfield *Soc Arts Mass* –**91**; mod. breech-loading rifled construct., A. Russell *Tech Q* * Apr –**92**; Whitworth mounting for high angle fire *The Eng* * July 24–**91**; U. S. breech-loading * Dec 9–**92**
MOUNTINGS, strs. Devastation and Rupert *The Eng* * Apr 24 –**91**
NORDENFELT, disappearing turrets for *Eng* * Oct 30–**91**; light quick fire batteries *The Eng* Jan 20, Feb 24–**88**
PNEU., torpedo, Zalinski *Eng* July 12–**89,** do. *R & Eng* * May –**88**; *Sc Am Sup* * Oct 12; the Dudley *The Eng* Sep 6–**89**
QUICK firing, rapid firing, Kimball *Eng* Jan 13, Feb 10, 24, Aug Aug 24–**88**; ed. Sep 30, Oct 7–**92.** See also GUNS, Drigg's—Gruson — Nordenfelt — Schneider, etc.
RIFLES of mod. armies *R & Eng* Jan –**88**; military rifle development, Califf * Jan * Feb –**89,** do., reduction of calibre in, Dunn *Sc Am Sup* Dec 22–**88**
RUSSIAN artillery in 1888 *The Eng* July 27–**88**
SANSPAREIL, the *The Eng* * Feb 6–**91**
SCHNEIDER quick-firing *Eng* * Sep 16–**92**
SMALL arms manuf., Rigby *Eng* Dec 2, *Inst C E, The Eng* Dec 2–**92**; magazine, tests, N. Y. * Sep 4–**91**

Guns, STEADY platform, Tower's *Eng* * Apr 26-**89**
TESTING at Sandy Hook, Perrine *E Mag* * June -**92**
THURLOW cast-steel *E News* Feb 16-**89**
U. S. mod. artillery *Eng* * Apr 29 - Sep 23, table (full) 30 * Oct 7, 21, 28 * Nov 4-**92**; new cannon for, n *E News* Jan 31; ordnance, notes, table *R & Eng* Aug -**91**, *Ar & Navy J.* See also GUNS, mortars, U. S.
Gutta-percha *El Rev Lond* Nov 21, Dec 5-26-**90**, Jan 2, expts. Mar 6, supply, n Oct 23-**91**, do., Serullas, May 20-**92**, future supply, do. *Sc Am Sup* Nov 5-**92**
Gymnastics, exercises and ap. *Sc Am Sup* * Mar 16-30 * Apr 6 -**89**; * June 7-**90**
Gyroscopes, Jansen, cor. *The Eng* * Sep 30-**92**

Hack, Thomas *Inst C E* v 93 -**88**
Hackney, William *Inst C E* v 100 -**90**
Haghe, Augustus *Inst C E* v 101 -**90**
Hall, Richard T. *Inst C E* v 99 -**90**
Hall, William J. *Inst C E* v 102 -**90**
Hallauer, Octave-René, Hirn *The Eng* June 13-**90**
Hamand, Arthur S. *Inst C E* v 97 -**89**
Hamill, Edward D. *Inst C E* v 109 -**92**
Hamilton, George A., por. *El Wld* * May 11-**89**
Hammers, Thwaite's suspen. pneu. power *Eng* * Mar 13-**91**; aut., the MacCoy pneu. tool *E News* * July 27-**89**; and rams, Jameson *R & Eng* Oct -**89**; the Longworth power * Aug -**92**, *The Eng;* pneu. *Sc Am Sup* * Apr 25-**91**; blows, force of, *The Eng* Aug 30-**89**. See also STEAM hammers
Hampton Roads *R & Eng* Oct -**90**
Hancox, Joseph *Inst C E* v 99 -**90**
Hand-writing, elec. transmitting, Gump * *Soc Arts Mass* -**89**
Hanna, Francis B. *Inst C E* v 102 -**92**
Hanscom, William W. *Am M E* -**88**
Harbor engineering *Eng* harbors, natural and artificial, Cheesewright, Mar 20; concrete in har. works, Apr 17-**91** * Aug 26 * Oct 7-**92**
E News physical phenom. of entrances, Haupt * Feb 25-**88**; excav. under water, cost, table, U. S. Eng'r. Dept., Jan 5; submarine excav. in sand, Ter-Meulen excavator * Mar 23-**89**; double sextant for hydrographic surveys * June 28; subaqueous foundations, Kinipple * Dec 13, 27-**90**; shore protection * Feb 6-**92**

Harbor engineering

E Rec subaqueous foundations, grouting below water, Kinipple, Feb 21; coffer dam or caisson without timber or iron, Harris, Mar 7; natural and artif., Cheesewright (full) * Apr 18-**91**, do. *Sc Am Sup* * May 30 * June 6-**91**; use of beton in construct. of ports, Kinipple * Nov 24-**88**; Am. eng., Wisner, Aug 15; Lobnitz system of rock removal under water without explosives *Oct 3-**91**; submarine excavs. in sand *May 18-**89**, *Genie Civil.* See also CANALS; DAMS; DOCKS; DREDGING; FIRE Is; FLOOD gates; FOUNDATIONS; LANDING stage; LIGHTHOUSES; MARINE signals, types; PIERS; PILES; RESERVOIRS; RIVERS imp., etc.

ANTWERP port works, Matthys abs. *Inst C E* v 101 -**90**

ARDROSSAN works *Eng* Nov 1-**89**

BARS, in tidal estuaries, Wheeler *Eng* Feb 7-**90**; imps., Haupt *F Inst* July, D'Auria, Sep, discuss., Haupt, Oct -**89**

BAYONNE port *Eng* * Dec 6-**89**

BEACON lights and fog signals, Douglass *The Eng* * Mar 29-**89**

BILBAO *E News* * Aug 31-**89**

BORDEAUX port *Eng* * Dec 13-**89**

BRAZOS river imp. and, Craighill, Corthell, discuss. *Am C E* v 26 -**92**

BREAKWATERS, concrete, Del. bay *E News* * Jan 31; do., Schermerhorn report (full) *E Rec* * May 16-**91**; and force of impact of waves, d'Auria *F Inst* Nov -**90**, Jan -**91**

BREMEN works, abs. *Inst C E* v 96 -**89**, *Zeit deut Ing* -**89**

BUOYS, elec. lighted, N. Y. *El Wld* * Feb 2-**89**; and beacons, the Pintsch compressed gas system *E News* * Jan 17-**91**; buoying and lighting tidal rivers, Wheeler *The Eng* * Apr 8, 29-**92**

CALAIS works, France *Eng* * May 17, inset, 24, 31-**89**; quay foundations, Betillart report *E News* * Jan 4-**90**; Richou, abs. *Inst C E* v 101 -**90** * *Genie Civil* v 15-**89**; inset *Inst M E* * July -**89**

CAPE Hatteras, Walters *E Mag* * July -**92**

CHARLESTON imp., Wisner *R Gaz* Sep 30-**90**

CHICAGO as a sea-port, maps *Eng* * Feb 20, do. *Sc Am Sup* * Mar 28-**91**; ed. *R Gaz* July 15-**92**

CORK port, deep-water quays, Barry, inset *Inst C E* * v 100 -**90**

CORPUS Christi, Tex., deep-water project, Kent *E & Min* * Aug 23-**90**

Harbor, DEFENCE, elec., Sims-Edison torpedo *El Wld* * Apr 25 -**91**
DELAWARE breakwater imp. *E News* * Feb 6-**92**
DIEPPE, Alexandre, abs. *Inst C E* v 93 -**88** * *An Ponts* v 14 -**87**
DOCKS, N. Y. bulk-head construct. *E News* * May 25-**89**; Royal Albert, blowing up of basin wall at, Thomas * Sep 20-**90.** See also DOCKS; HAR., Hull — Limerick, etc.
DUBLIN port, Griffith, insets *Inst M E* * July -**88**
DYKES, brush, spec. for, Craighill *E News*, Oct 19-**89.** See also DIKES; HOLLAND, do; RESERVOIRS; RIVERS, imp.
ENGLISH, new schemes *Eng* Jan 23-**91**; Brit., and water-ways *The Eng* Aug 5-**92.** See also HAR., Goole
GALVESTON, Tex., entrance imp., Wisner, cor. *E News* Dec 6-**90**; prob., Haupt *F Inst* Oct -**91**
GOOLE port imp., E. coast, England *The Eng* * Dec 20-**89**
GREAT Yarmouth, Ayers, cor. *Eng* * Dec 13-**89**
HAMBURG, Alster lock widening, Roeper *Inst C E* v 107 -**92** * *Deut Bauz* -**91**
HAVRE port *Eng* Oct 25, Nov 8 * 29-**89**; imp. of sea-ports of Seine, LeBrun, abs. *Inst C E* v 93 -**88,** Rochemont *Mem Soc Ing Civils* * Mar -**88**; imp. n * *Sc Am Sup* Apr 13-**89**
HELL-gate, N. Y. See HAR., N. Y.
HULL, Alexandra docks, Hurtzig *The Eng* Mar 2-**88**
INDIA, West of, Portuguese R., Sawyer, insets *Inst C E* * v 97 -**89**
ITALY ports of, Gatto, abs. *Inst C E* v 104 -**91,** *Il Polit* -**90.** See also HAR., La Rochelle — Naples
JETTIES as applied to har. entrances, U. S., Haupt *Inst C E* v 99 -**90.** See also RIVERS, jetties
LAKE Ontario natural harbors *E News* * Mar 8-**90**
LA ROCHELLE works, Italy, com. report, abs. *Inst C E* v 95-**89,** *Giorn Genio Civil* June -**88**
LIMERICK dock walls, failure and construct., Hall *E Rec* * Mar 28-**91,** *Inst C E*
LYNN Haven Bay as a har. of refuge Barroll *R & Eng* * Dec -**91**
MALINO, Sweden *E News* * May 26-**92**
MARIANOPOL works, Hermann, abs. *Inst C E* v 103 -**91** *An Ponts* Aug -**90**
MEMPHIS imps. *E News* * Nov 2-**89**

Harbor, MONTREAL imps. *E News* * May 2-**91** ; old revetment wall, Sproule *R & Eng* * Dec, *R Gaz* * Nov 18-**92**
NANTES port of *Eng* * July 19, 26-**89**
NAPLES works, Gatto, abs. *Inst C E* v 102 -**90**, *L'Ingeg Civile* -**90**
NEW York, bulk-head construct. *E News* * May 25-**89** ; imp. of entrance, Edwards, dredging ap., inset * Mar 19 ; masonry sea-wall, light-house station * Dec 15-**92** ; removal of obstructions, Hell-gate, abs. *Inst C E* v 93 -**88**, * Report Ch. of Eng'rs. U. S. Army -**86** ; imp. *Sc Am Sup* * Aug 25-**88**
OTAGO imp. Barr *Inst C E* v 110 -**92**
PIERS. See PIERS ; WHARFS
PHILADELPHIA port of, Haupt *F Inst* Jan, Mahan, Mar, Apr -**92**
POINT Judith harbor of refuge, R. I. *E News* * Apr 18-**91**
POOLE improvement *The Eng* May 8-**91**
PORTSMOUTH, tides near, Townshend, inset, abs. *Inst C E* * v 97 -**89** ; dockyard, C. Robinson *Sc Am Sup* * Dec 3-**92**
PRESTON docks *The Eng* Mar 23-**88**
RICHMOND, Va., eng. prob. at, Adams *Am M E* * v 12-**91**
ROCHELLE, compressed air pier foundations, Thurninger, La Pallice har., abs. *Inst C E* v 100 -**90**, *An Ponts* * Nov -**89**
ROUEN port of *Eng* * Oct 11-**89**
SABINE Pass imp., Turtle, cor. *F Inst* Sep -**88**
ST. John, N. B., imp. and docks *E News* Apr 7-**88**
ST. Nazaire, France, lowering masonry shafts for quays, Mahan *E News* * Oct 27-**88**
SALTBURN-by-Sea, works near *Eng* * Mar 14-**90**
SAN Francisco, water-front structures, Manson *E News* * Dec 29-**88** ; caisson used in founding sea-wall, R. Hunt * Aug 2-**90**
SCOTLAND, N. and West coast piers and, Barron, inset *Inst C E* * v 99 -**90**
SEA-walls, use of asphaltum in, Ambrose, and discuss. *Am C E* v 24 -**91**, do. *E Rec* May 16-**91** ; caisson used in founding, San Francisco, R. Hunt *E News* * Aug 2-**90** ; masonry, light-house station, N. Y. * Dec 15-**92** ; sinking foundation of by water-jet *E Rec* * Mar 14-**91** ; Scarborough, No. Cliff, and Royal Albert drive securing, Aytoun, insets *Inst C E* * v 105 -**91**
SWANSEA port and dredging entrance channel, Capper *Inst C E* v 103 -**91**

Harbor, TEXAS deep-water port, need of the So. West, Haupt *R Gaz* Aug 10, *Sc Am Sup* Oct 6-**88**
TORONTO esplanade question *E News* * Jan 4, 11-**90**
U. S. river and har. appropriations *E News* Mar 8-**90**; Southern states tide-water terminals, Haupt *R Gaz* Mar 15, Apr 12 -**89**
VERA Cruz port, *E Rec* Dec 6-**90**, Corthell cor. Feb 21-**91**
WILHELMSHAVEN, second entrance construct., Rechtern, abs. *Inst C E* v 107 -**92** * *Zeit Arch Ing* Hanover -**91**
WIVENHOE, dry dock at *The Eng* Aug 17-**88**
YOKOHAMA *Eng* * Dec 12-**90**, cor. May 22-**91**
Hardcastle, Bey, William J. *Inst C E* v 107 -**92**
Harker, Harold H. *Inst C E* v 109 -**92**
Harp, the clavi-harp *The Eng* Apr 27-**88**
Harper, Edmund L. *Inst C E* v 105 -**91**
Harpur, Samuel *Inst C E* v 95 -**89**
Harris, Robert *Inst C E* v 110 -**92**
Harrison, John T. *Inst C E* v 109 -**92**
Harrison, Thomas E. *Eng* Mar 23, por. * Apr 13, *The Eng* Mar 23, por. (full) *Inst C E* * v 94-**88**
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Hawaii, business opportunities, Hau *E Mag* * June -**91**
Hawkes, Edward C. *Inst C E* v 101 -**90**
Hawkins, Edward J. *Inst C E* v 109 -**92**
Hawkins, George *Inst C E* v 95 -**89**
Hawkshaw, John *Eng* June 5, *The Eng* June 5, por. (full) *Inst C E* * v 106 -**91**
Hay fever, Stockwell (full) *Sc Am Sup* Aug 31-**89**
Hay-press, and straw, Roy. Agric. Soc. trials *The Eng* July 6-20 -**88**
Hayti, Ravine du Sud, averting overflow, Crowell, insets *Am C E* * v 24 -**91**
Hayward, William *Inst C E* v 103 -**91**
Heal, Chesley, the centenarian *Locom* Mar, *Sci Am*, por. (108 years old) *Sc Am Sup* * Mar 16-**89**
Health, congress, Lond., pro. *Eng* Aug 14-28-**91**; and physical exercise, Taylor *F Inst* Sep, Oct -**92**; prevention of consumption, Prudden *Locom* Aug -**89**; disinfection *The Eng* May 11, 18, the Lyon's, June 1-**88**
Hearst, George, por. *E & Min* * Mar 7-**91**

Heat, thermal quantities, graphic representation of, De V. Wood *Am M E* * v 11 -**90**; transmission through cast iron plates pickled in nitric acid, Carpenter, do. Royse * v 12, 12 -**91**; temp. taking by tuning forks *El Rev* Aug 15-**91**; proposed nomenclature in practical thermics, Wurtz *E & Min* Dec 14, 21-**89**

E News production from electricity, ed. Aug 9; mechan. equiv. of, Rowland's expts. for det., n Aug 16-**90**, do. De V. Wood *Steven's Indic* July 15, do. *Locom* Feb, do. *R & Eng* Feb -**88**, expts., Perot (full) *F Inst* Jan, Isherwood * Feb, Joule's equiv., Thurston, Apr -**92**, hist. of *Locom* Apr -**89**, do., Hanssen *Sc Am Sup* Apr 21, Wood, May 26-**88**, *J Gas Lt'ng*

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MOTORS, Hargreave's thermo-motor *Sc Am Sup* * Feb 18-**88**, *Industries;* triple thermic, Haswell *Sc Am Sup* Apr 14-**88**, *Am C E*

REGULATING, Hawkin's aut. ap. *Am M E* * v 9 -**88**; Johnson's system, Chester *Soc Arts Mass* -**88**

Heaters, unbraced wrt. iron, heads *Locom* * Feb -**90**. See also BOILERS, feed-water heaters

Heating, ap., Hawkins aut. regulator *Am M E* * v 9 -**88**; house heating, L. Allen *E Mag* July - Sep -**92**; processes prog. and heavy chemical manuf. '90, Lunge (full) *E & Min* Apr 25-**91**; green-house, Conrad *E Rec* Mar 29; proportioning radiating surface, Carpenter, Nov 29-**90**; system on receiving tanks *Locom* * Jan -**90**; action from open grates, stoves and hot pipes, Dye (full) *Sc Am Sup* * Mar 12; gas production and ammonia, Hennin, Oct 15-**92**. See also CARS, heating

BOSTON Heating Co. plant, Abbott, insets *Am Min* * v 16 -**88**, notes *E News* Jan 14, Dec 8-**88**, plant *E Rec* * Apr 28 * May 5-26-**88**

MASS. Inst. of Tech. system, Boston *E News* * Feb 25 * Mar 3 * May 19-**88**

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Heliochromy. See PHOTOGRAPHY, heliochromy

Helme, William *F Inst* Aug -**88**

Helmholtz, Hermann Von, por. *El Wld* * Sep 3-**92,** por. (full) *Sc Am Sup* * Oct 10-**91**

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Hilgard, Julius E. *Am C E* v 27 -**92,** por. *E News* * May 16 -**91**

Hills, Graham H. (full) *Inst C E* v 95 -**89**

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Hingeston, Charles H. *Inst C E* v 104 -**91**

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Hot air engines, McGahie *Cassier's* * Mar -**92**; Woodbury-Merrill's and tests *E News* * Sep 14-**89**; Benier's, abs. *Inst C E* v 92 -**88,** *Dingler* 267 -**88,** *Sc Am Sup* * Apr 27 * Dec 7, Paris exhib. *Eng* * Aug 30-**89,** *The Eng* * Sep 5-**90**; the Rider, Aug 10-**88**; Robinson's * Nov 28-**90**; Hargreave's *Pwr* * Mar -**88**; Woodbury's * Oct -**89.** See also THERMO-motor

Hot water heating. See HEATING, hot water

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Iron and steel

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Iron and steel

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Iron and steel
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R Gas produc. in '89, Jan 31-**90**, and steel rail, '91, Jan 29-**92**; Outerbridge *Sc Am Sup* * Apr 14-**88**; silicon in, C. Jones * Sep 21-**89**; elim. of sulphur from, Massenez * Nov 21-**91**; how forms in blast furnace, see BLAST furnaces
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ROBERT process for *Sci Am* Mar 16-**89**, *Harper's W*
ROLLING mills, evolution of, R. Hunt *Am M E* v 13 -**92**; suspended feed table, Morgan *Am Min* * v 19 -**91**, do. *E & Min* * Dec 13-**90**; Jardine's screwing gear *Eng* * Oct 16-**91**; Schutz-Knaudt Co., Essen * Sep 2, 16-**92**; universal, for girders and cruciform sections, Sack *Sc Am Sup* * July 20, do. *E & Min* * June 8; Seaman's univ. * July 13; rolling steel rails, Nicholson * Nov 30-**89**; evolution of Am., Hunt, Nov 21, 28-**91**; rolling fluid metal, Bessemer's early expts. *E News* Oct 24, Dec 26-**91**; St. Jacques works *Sci Am* Feb 9-**89**
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Irrigation
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Labor

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Life-buoy, the Franklin *Eng* * Nov 20-**91**
Life insurance, life-expectancy rule *Locom* July -**86**; the expense margin in, Wills *Sc Am Sup* Jan 31-**91**
Life-saving, and salvage str. Aid, inset *Eng* Mar 4; U. S. Service, Piper *F Inst* Jan; devices, Woolven *Sc Am Sup* * Apr 2, 16-30 * May 14 * July 2, 9, 23 * Aug 20, 27 * Sep 10 * Oct 1, appliances * Dec 10-**92.** See also LIFE boats—buoys; U. S. Life Saving Service
Lifts. See ELEVATORS; HYDRAULIC lifts
Light, photometry, personal error in, Nichols *El Eng* * July -**89**, new photometer, do. * May 28, do. *El Rev Lond* July 4-**90**; photometric research, R. C. Richards * Mar 27 * Apr 3 * Sep 4 -25, Oct 2, 9, 16-**91**

El Rev and color, Spice, Mar 30; and electricity, identity of, Herz, Dec 14-**89**; new photom. notes, Nichols, May 31; units of light and brightness, Weber, Sep 6; Varley's photom. * Oct 18; artificial, of future, Nichols (full) * Nov 29-**90**

El Wld photometry, personal error in, Nichols * June 1-**89**; new photom., do. * May 31; the Bolometric spectrometer * June 21; artif., of future, Nichols (full) * Nov 29, discuss. Dec 6-**90**; photometers * Apr 25-**91**; Hering's portable photom. for st. lights and illum. * Jan 16-**92**

Eng refraction goniometer, Trotter * May 17-**89**; illum., distrib. and measurement of, do. *E News* * Nov 24, do. and discuss. (full) *Inst C E* * v 110-**92**; the ether-oxygen lime light,

Light

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El Rev Lond Varley, July 20 – Oct 12, Nov 2, rotary motion, Parker, Dec 14-**88**; arresters and self-induction, Acheson * Feb 1, 15; Lodge (full) May 3-24 * June 6-20; conductors, Varley, July 5 * 19, Aug 9, Oct 4, 18-**89**; connection, Fischer, Jan 24, 31, Feb 7; Mar 14-28; Apr 4, 11; conductors, Varley, May 24, 31, June 7-21; thunderstorms, Hazen, Aug 15; protection of buildings, Bennett, Oct 10-**90**; damage, curious case, Hands, Jan 8, protection, do. Feb 19-**92**

El Rev peculiar motions of, Parker * Nov 24-**88**; arresters and self-induc., Acheson (full) * Jan 19-**89**; arresters and discov. of non-arcing metals, Wurtz * Mar 26; rods, McAdie, Sep 17-**92**

El Wld protection of elec. light stations, Jenks (full) * Aug 18; rotary motions in, Parker, Nov 24-**88**; arresters and self-induc., Acheson (full) * Jan 19, Brown, Child * Feb 23-**89**; Lodge's protectors (wires) * May 17; and the elec. spark, Bid-

Lightning
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Eng protection from, ed. Aug 3 * Sep 7; conductors, Brit. Assoc. pro. Oct 19, 26; flashes * Dec 21-**88**; rods, E. Thomson *E Rec* July 11-**91**; Jovè's autograph, Jennings, insets *F Inst* * Jan -**92**; conductors, Kohlrausch, abs. *Inst C E* v 93 -**88**; do., connecting with water and gas pipes, Weber, abs. v 95 -**89**; conductors, Frisch report *Sc Am Sup* Jan 26; discharge, influence of gas and water pipes, Wilde, Aug 3-**89**; protection of chimney shafts, Molyneux, Wood, Apr 19-**90**; rod protection, Hodges, Apr 18-**91**; peculiar rotary motion of and elec. curs., Parker * *Soc Arts Mass* -**89**

Limberg, Charles T., por. *E & Min* * Apr 25-**91**

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Linnæus, por. *Sc Am Sup* * Feb 18-**88**

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Locomotives

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ABT, Manitou & Pike's Peak R. *R Gaz* * Feb 6-**91**

AIR-pump governor, Barnes', Wabash R. *The Eng* Oct 19-**88**

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BELGIAN, State R's, express pass., Paris exhib. *Eng* July 5, 5, *The Eng* * May 3, 31, 31-**89**; goods, Paris exhib. * Jan 24-**90**

BELL-ringer, steam *R Gaz* * Mar 8-**89**; White's pneu. * Aug 8 -**90**

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BLAST, pipe, influence of intermediate tuyeres, Fliegner, abs. *Inst C E* v 91 -**88**, *Schweiz Baus* Nov 5-**87**; nozzle, Adams' variable *R & Eng* * Oct -**90**, *Eng*; pipes, Kordina's vortex *The Eng* Jan 20-**88**

BOILERS, strains in, Randolph *Am M E* v 9 -**88**; imps. in construct., Hickey *E News* * Apr 4-**91**; construct. and effic., Sheffield *Inst C E* * v 109 -**92**; *Locom* Nov -**88**; ed. *R & Eng* Oct -**88**; without stay-bolts, Bork * May; expts. with, rate of combust., B. & O., temp. in smoke-boxes, Wells, ed. * Aug -**90**

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ALTOONA and Penn shops, notes, ed *E. News* Apr 26-**90**

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FIRE-boxes, the Darby crown sheet, Grand Trunk R., Can. *Eng* * Aug 24-**88**; Webb's * May 17, 17; corrug. steel, Lond. & N. W., Webb * Aug 23-**89**; the steam-jet as a means for preventing smoke *E News* * Apr 4-**91**; ed. *R & Eng* Jan; corrug. tubular, Knaudt, abs. June; fire-brick lined (full) * Oct, Phelps, cor. Nov -**89**; corrug., Lentz, Apr -**90**; Forney's door opener * June; corrug. * Sep -**91**

R Gaz and coal burning, Higginson, and ed. July 20-**88**; Master Mechanic's com. report, June 27-**90**; staying, Woods, Apr 17; Hawksworth's door opener * May 1; Ten Brinck fuel saving tests, Orleans R., France * 8, 22-**91**, *Ing Civils;* Webb's steel *The Eng* * June 14-**89**

JOHNSTONE compound *R Gaz* * May 27-**92**

KNAUDT & Pohlmeyer's, Prussian State R's *Eng* * Oct 4, *R Gaz* * Nov 15-**89**

LENTZ'S stayless *Eng* * Dec 19, *R Gaz* * Apr 4-**90** * Jan 9 -**91**

SPEIRS' construct. *E News* Jan 23, Dean, 30, (full) *R Gaz* Jan 22-**92**

WOOTTEN, U. Pac. express pass. *R Gaz* * June 15 * July 6-**88**

BOSTON & Albany 4-wheel switching *R & Eng* * Nov, Dec -**91**

BRAKE gear diags., Am. Brake Co., cor. *E News* * Jan 26-**89**

BRISTOL & Exeter express *The Eng* * May 9, 9-**90**

BUILDING, Am., '88, n *Eng* Mar 8-**89**; in New So. Wales, June 6-**90**; in '89 *E News* Feb 1; 40 years' course of, French, inset *The Eng* * June 20, July 18-**90**

CAB, Balt. & Ohio *R Gaz* * Dec 16-**92**

CALEDONIAN R. bogie pass. *The Eng* Apr 13, 13-**88**; No. 123, performance, diags. * Mar 13-**91**

CANADIAN Pac. 10-wheel heavy pass., inset *Eng* * Jan 17, inset *E News* * Aug 30-**90**; mogul, inset *R Gaz* * May 31, inset *The Eng* * June 21-**89**

CAPE Gov't. R's, coal burning of Colonial coal on, Stephens. insets *Inst M E* * Jan -**90**

CAVAN R., light locom. *The Eng* Apr 20, 20-**88**

Locomotives, CHESAPEAKE & O. 10-wheel pass., Rogers works *R & Eng* * July -**90**; tank switching, 2500 gals. *R Gaz* * July 27-**88**

CHICAGO, Bur. & Q. pass., inset *E News* * June 28; standard mogul * July 5-**90**; suburb. pass., inset, ed. *R Gaz* * Dec 13-**89**; 75-ton decapod, Rogers works, inset * July 24-**91**

CHICAGO, Mil. & St. P. express *R Gaz* * Feb 20, details * Mar 6-**91**

CLEVELAND, Cincin. Chic. & St. L. *R Gaz* * Jan 1-**92**

COALING chutes *R Gaz* * Dec 11, 18-**91**; coaling stations, Berg, Feb 5 * 19-**92**

COMPOUND *Eng* E. Worthington, Jan 11; Lapage * Mar 22, 29 * Apr 5-**89**; English pats. on, abs., Feb 27, Apr 17-**91**; Sinclair *E News* Apr 20; Am. * Nov 30-**89**; Am. Master Mech's com. report, and ed. June 28, 28-**90**

E & Min compounding petrol. refuse burning, Russia, Urquhart, abs. Sep 14-**89**, insets, discuss. (full) *Inst M E* * Jan -**90**; Lapage, discuss., insets * Jan -**89**; the compound principle applied to, E. Worthington, insets *Inst C E* * v 96-**89**; Polonceau, n v 99 -**90**; Brueckmann, abs. v 104 -**91**, *Soc Ing Civils* Oct -**90**; relative value of different types, abs. *Inst C E* v 106 -**91**, *Am Mas Mech* 24th report

R & Eng 4-cyl., Bousquet, and ed. * Mar -**89**; Master Mech's com. report, July -**90**; development of compound system, Mallet (full), Feb, ed. * Mar - June -**91**; Webb, Jan; early description, n * June, ed. Sep -**92**, *F Inst*

R Gaz in Am. service, ed. * Feb 15, 22; Sinclair, N. E. R. Club discuss. Apr 19; May 10; starting power of, Neale, cor. Aug 16; Barnes, discuss. Oct 18: India, Hughes * Nov 22; ed. * Dec 20-**89**; mathematics of, French, Mar 7; Polonceaux, Apr 18; Master Mech's com. report, June 27; early, Perry & Lay * Sep 19-**90**

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Locomotives, COMPOUND, ARGENTINE Great Western, burning liquid fuel *The Eng* * May 15-**91**
ARGENTINE Midland R. *The Eng* * Dec 27, 27-**89**
AUSTRALIA, Baldwin, tests of Vauclain (full) *R Gaz* May 29 * Aug 7-**91**
BALDWIN four-cyl. and ed. *R Gaz* * May 2, 2-**90**; * May 1, table, Nov 27-**91**. See also LOCOMS., comp., Balt.
BALTIMORE & O., Baldwin, details, inset *E News* * May 3, 3, tests of and ed. Sep 6 * 13, 13, narrow-gauge * Dec 13; tests, Barrus (full), and eds. Sep 12, 12, 19 *The Eng* * Sep 19, 26 -**90**
BATCHELLER'S pat. valve *R & Eng* * May; R. I. Locom. works, Franklin Inst. medal *R Gaz* June 3-**92**
BROOKS two-cyl. *R Gaz* * Nov 25-**92**
CHICAGO Mil. and St. P. tests, inset *R Gaz* * Aug 5, 5-**92**
DEAN'S *R Gaz* * Nov 25-**92**
EAST Tenn. Vir. & Ga. indic. diag. *E News* * Nov 22-**90**; ten months' test of, Dec 5-**91**
FRENCH *R & Eng* * Aug -**89**; recent *R Gaz* * Jan 3-**90**
GERMANY, in, Stambke *E News* * Apr 19, May 3-**90**
GRAZI-Tsaritsin R. goods, petrol. refuse, Urquhart *The Eng* * Jan 31-**90**
HUNGARIAN State R's *E News* * Feb 6-**92**
JOHNSTONE'S double truck, Mex. Cen. *E News* * Aug 29-**91** * Mar 12-**92**; abs. *Inst C E* v 106 -**91**; Mex. Cen., tests (full) *R Gaz* * May 22, 29, Oct 9; 10-wheel, inset * June 5; trials anal., cor. Sep 25-**91**; double bogie, Mex. Cen., inset * Mar 25, test * Aug 26 (full) * Dec 30, 30-**92**. See also LOCOMS., comp., Mex. Cen.
LAKE Shore & Mich. So. frt. *R & Eng* * Dec -**92**
LINDNER'S starting gear, system for *E News* * June 16, do. *R & Eng* * Dec -**92**, do. *R Gaz* * Nov 15-**89**; do. in Russia * Mar 13, 27-**91** * Sep 2-**92** *The Eng* * May 23-**90**
LONDON & No. W., Edinb. exhib., inset *Eng* * July 25-**90**; Webb's, with Joy valve gear *E News* * Jan 26-**89**; frt. *R & Eng* * Feb; Webb's *The Eng* Dec 21, 21-**88**
MALLET'S, Decauville R., Paris exhib. *Eng* * May 3, do. *E News* * June 1-**89**; largest and smallest *R Gaz* * Aug 15-**90**; prog. in use of * Feb 6, arguments pro and con, Polonceau, 13-**91**, *Ing Civils*; Paris exhib. *The Eng* * May 24 -**89**

Locomotives, COMPOUND, MEYER-Lindner duplex, Roy. Saxon St. R. *R Gaz* * Sep 2-**92**

MEXICAN Cen. 10-wheel Johnstone's double truck, inset *E News* * Aug 29-**91** * Mar 12, inset (full) * 26 * Apr 2, valve motion * 9-**92**; Johnstone, tests *R & Eng* * June, n Aug -**91**, Nov -**92**, do. *R Gaz* May 29, Oct 9-**91**, test * Aug 26-**92**

MEXICAN National R., dimens., news n *E News* Dec 13 -**90**

MICHIGAN Cen., Schenec. works *Eng* * Apr 4-**90** *E News* Jan 25, and ed. * Mar 8-**90**; ed. *R Gaz* * Jan 31, ed. Feb 14-**90**; 10-wheel pass. * Jan 23-**91**

MISSOURI, Kan & Tex., and simple, comparative tests *R Gaz* Nov 11-**92**

NORTH Eastern R., England, express, Worsdell, inset *Eng* * Mar 30 * Apr 13-**88** * June 21, 21-**89**; pass do. *R & Eng* * May -**90**; tank engine *The Eng* Oct 26, 26, goods tank, Nov 23, 23-**88**; express, inset * Feb 28 * Mar 7-**90**

NORTHERN R. of France, goods, Paris exhib., inset *Eng* * Dec 6-**89**; 4-cyl. fast pass., Bousquet, n *R & Eng* Jan * Aug *R Gaz* * Aug 12 *The Eng* * Sep 2-**92**

PARIS, Lyons & Med. R. *The Eng* * Aug 9-**89**

'PENN,' the *R Gaz* * May 3-**89**

PITKIN'S pat. *R & Eng* * Mar -**90**

PRUSSIAN State R's, goods, Worsdell system, inset *Eng* * Feb 1-**89**

RHODE Is. Locom. works, com. report, insets (very full) *F Inst* * May -**92**; Batcheller, bk. review *R & Eng* Jan -**91**; test in express service, Jan -**92**; and simple, study of, expts. *R Gaz* * Jan 9; system of (full) * Dec 11-**91**

RUSSIA, petrol. fuel, Urquhart *Eng* Feb 7 * 21 * Mar 7, do. *E News* * June 14-**90**

ST. Gothard R., duplex *E News* * Aug 15-**91**

ST. Petersburg & Warsaw R., pass., inset *Eng* * Sep 9, *R & Eng* * Nov -**92**

SAXON State R's express, dimens. *R Gaz* * Nov 22, 29-**89**

SOUTHERN Pac. *E News* * Apr 28-**92**; 10-wheel, inset *R Gaz* * Sep 11-**91**

SWISS, Jura-Berne-Lucerne R., pass. mogul, inset *Eng* * Feb 7; *R Gaz* * Sep 12-**90**

TESTS, Baldwin, Balt. & O. and ed. *E News* * Sep 6, 13, 13; Union El. R., Brooklyn, in fast pass. service, Dec 27-**90**

Locomotives, COMPOUND, TESTS
* Jan 3; 10 months, E. Tenn. Vir. & Ga. Dec 5, 12-**91**; Vauclain * June 23, ed. 30, 30, indic. diag. * July 7-**92**; Johnstone, Mex. Cen. *R & Eng* * June * Aug; W. N. Y. & Pa. R. Oct -**91**; R. I. works, in express service, Jan; Johnstone, Mex. Cen. Nov -**92**
R Gaz B. & O., Barrus, (full) Sep 12, 19-**90**; R. I. works expts. * Jan 9; Johnstone's (full) * May 22; Vauclain, May 29, * Aug 7; Johnstone, trials anal., cor. Sep 25; and simple, comparative, W. N. Y. & Pa. Oct 2, Baldwin, Mex. Nat. Dec 4-**91**; Johnstone, Mex. Cen. * Aug 26; and simple, comparative, Mo. Kan. & Tex. Nov 11-**92**; comparative, Hudson *Sc Am Sup* Jan 23-**92**, *J Assoc E Socs;* B. & O. *The Eng* * Sep 19, 26-**90**
VALVE gear, variable expansion, Dunlop, cor. *Eng* * Feb 13-**91**; for Hope & Co., cor. *R Gaz* Sep 19-**90**
VAUCLAIN, 4-cyl. *E News* * May 3-**90** * Feb 20; tests * June 23, ed. 30, 30, indic. diags. * July 7-**92**; com. report *F Inst* * July -**91**; patent, n *R & Eng* Jan -**90**; tests *R Gaz* May 29, Australia, Baldwin, tests * Aug 7-**91**; Manitou & Pike's Peak rack R., n * Aug 12-**92**
VON Borries', starting valve for (full) *R Gaz* * June 12-**91**. See also LOCOMS., comp., Worsdell & Borries
WEBB'S, Lond. & N. W., with Joy valve gear *E News* * Jan 26, *Eng* * June 7-**89**, *The Eng* Dec 21, 21-**88**
WOOLFE 4-cyl. double-expan., ed. (full) *R Gaz* * Mar 8, 8 -**89**
WORSDELL, N. E. R. express, inset *Eng* * Mar 30 * Apr 13-**88**; Worsdell & Borries' system, goods, Prussian State R's, inset * Feb 1; N. E. R. express, inset * June 21, 21-**89**, do. *R & Eng* * May -**90**; applic. to Am. type of locom. *R Gaz* * Dec 14-**88**; Grand Trunk R. * Nov 6-**91**; Bengal R. *The Eng* July 20-**88**
WRIGHT'S *R Gaz* * Jan 30-**91**
COMPRESSED air, 40 and 50 ton, Mekarski system, for Paris, France *E News* * May 31-**90**. See also STREET railroads, compressed air motors
CONNECTING rods, side rods, N. W. R. Club discuss. *R Gaz* Nov 21-**90**; and crank pins, Chic. B. & Q. R. * Jan 16-**91**; parallel rod resistance, Apr 8-**92**; *The Eng* May 25, June 22-**88**

Locomotives, COUNTERBALANCING, recip. parts, Lanza *Am M E* * v 10-**89**; W. H. Lewis *E News* * Apr 26-**90**; eds. *R & Eng* * Feb - Apr -**90**; Hill *Inst C E* * v 104 -**91**; Lanza *R Gaz* * Oct 19-**88**; Booth, cor. * Oct 11-**89**; in 3-cyl. compound, cor. and ed. * Mar 21, review of, 21, Booth, cor. and ed., Apr 4; W. H. Lewis * 25; Western R. club discuss. May 30-**90**, Barr discuss. do. * Mar 6-**91**; expts. on methods, Lanza *Tech Q* * Feb-**89**

CRANK-pin turning machine, Urquhart *Eng* * Apr 12; at Paris exhib. * Sep 27-**89**

CRANK shaft, expts. with, Ivatt *R & Eng* * July -**91**, steel, test of, do. *The Eng* * Apr 3-**91**

CYLINDER cock, Riggin's combination *R Gaz* * July 4-**90**

CYLINDERS, design, Barker, inset *Inst C E* * v 106 -**91**; steam action in at high speeds, ed. *R Gaz* Nov 22-**89**; proper capacity for pushers on grades, ed. * Dec 19-**90**; means for increasing power at speed, ed. Oct 23-**91**; and slide valves, Lond. Br. & So. C. *The Eng* Aug 23-**89**

DELAWARE, Lack. & W. mogul frt. *R Gaz* * Feb 3-**88**

DOUBLE end saddle tank, Porter *R Gaz* * June 14-**89**

DOWNWARD draft, Complete Combustion Co. *E News* * Aug 2 -**90**

DRIVING-box linings, opinions, table *R Gaz* Mar 28-**90**

DRIVING-wheels, 'imperceptible slip,' Sargeant, C. B. & Q., tests of, table *E News* June 14; ap. for removing paint from, Horton * Oct 11-**90**; Vauclain's centers, com. report *F Inst* * July -**91**; big *R & Eng* Nov -**92**; size of express, ed. *R Gaz* Oct 26-**88**; 7½-ft. cast steel, N. E. R., England * Mar 7-**90**; Vauclain's wrt. iron centers * July 10-**91**; best size of, Greenhill *The Eng* Mar 29-**89**; polygonal * Apr 4-**90**

DRIVING-wheel tires, Bess. steel, Arnold *Eng* Dec 7-**88**; wear of, cyl. wheels and flat-topped rails, Whittemore *E News* * Feb 9, and ed. 16, 16, 23, ed. Mar 2; tests, Mich. Cen. * May 11-**89**; retaining ring for * July 19; hollow, dangers of in contact with frog points, Perry * 26; breakages in Germany, Aug 9; steel, and attaching do. with different fastenings, Rhodes, Nov 8 * Dec 6-**90**; irreg. wear of, Barr * Feb 7-**91**, do., Herr * June 16-**92**

Inst C E and rails wear on curves, Helmholtz, abs. v 93-**88**; Bess. steel, influence of chem. composition on strength, Arnold, discuss. * v 95 -**89**; oil-gas tire setting ap., G. T. R., Wanklyn,

Locomotives, DRIVING-wheel tires
abs. v 104 -**91**; and axle specs., English *R & Eng* * Aug; German fastenings * Aug -**91**
R Gaz wear of, table, Master Mech's com. rep. June 22-**88**; steel, influ. chem. compos. on strength, Arnold, Mar 8-**89**; steel and Ross-Meehan shoe, N. E. R. club discuss. Oct 17; steel, attaching to center, Rhodes, Nov 7, fastenings, do. * Dec 5-**90**; irreg. wear of, Barr * Feb 6; wear, flat spots on * Mar 20; steel, tests, Roussel * Apr 3-**91**; stresses in, cor. Jan 22; irreg. wear of, Barr * June 17; shrinkage of, table, July 15; wear, Herr, discuss. * Oct 21-**92**
EASTERN R. of France, tank, Paris exhib., inset *Eng* * Aug 30 * Sep 20-**89**; Flaman boiler (compound), inset * Mar 25 * Apr 8, 22; fast *R & Eng* * Mar -**92**; express experimental *The Eng* * Nov 13-**91**; double-boiler express, inset * Mar 4, 11 -**92**
ELECTRIC, Manhattan Elevated R., and steam, comparative tests, Moss, insets *Am C E* * v 23-**90**; A. Siemens *El Rev Lond* * Aug 12, do. results, City & So. Lond. R. *Eng* * Aug 19, do. *E & Min* * Sep 3-**92**; and steam, compar. tests, effic., Moss *E Rec* July 19, do. *The Eng* Aug 29, do. and ed. (full) *R Gaz* * July 11, Moss, cor. 18-**90**; Weem's high speed, expts., Crosby (full) Mar 13-**91**; as substitutes for steam locoms., Woods, June 24-**92**; Daft, trial, N. Y. El. R. *Sc Am Sup* * Mar 2-**89**
ENGINE drivers, hours of *Eng* Jan 30-**91**
ENGLISH, and Am. and ed. *E News* Aug 2, 2, discuss. Oct 11-**90**; use of truck on *R & Eng* * Aug; express, Paris exhib. * Nov -**89** *The Eng.* See also LOCOMS., Am. and English — erecting
ERECTING *Eng* * Dec 18-**91**; English *R Gaz* * Sep 28; at Altoona *The Eng* Sep 28-**88**
ESTRADE's high-speed, Paris *Sc Am Sup* * Apr 28 *The Eng* Mar 9, 9-**88**
EXHAUST, nozzle, Macallan's variable *Eng* * Aug 22-**90**; muffler. Penn. R. *E News* * July 21-**88**; pipe, Smith's triple-expan. Mar 16-**89**; pipes, nozzles, etc., Am. R. Master Mech's report * June 20-**91**; nozzles, single and double, ed. *R Gaz* * May 16 -**90**; pipes report * June 19; nozzle, Mertsheimer's variable * July 31-**91**; ap., common sense about, ed. * June 17-**92**
FAIRLIE system, Mex. Cen., inset *Eng* * Mar 14-**90**

Locomotives, FEED water heater and purifier, Barnes' *E News* * Aug 9 *R Gaz* * July 25-**90**; purification, Northwest R. club discuss., C. N. Hunt, Dec 13, 20-**89**

FIRE-boxes, brick arches in, Am. R. Master Mech's com. report *E News* Aug 9-**90.** See also LOCOMS., boilers, fire-boxes

FIRE extinguisher, Penn. R. *R Gaz* * July 19-**89**

FREIGHT, hauling capacities, table *R Gaz* Nov 21-**90**

FRENCH, Paris exhib. *R & Eng* * Nov, pass. * Dec -**89**; tank * Feb -**90** *Eng;* notes *R Gaz* * Jan 16, 23-**91**; Chemin de fer d l'Ouest, express *The Eng* * Oct 4, 11-**89.** See also LOCOMS., Eastern R. of France

FUEL, premiums, Russia, Borodine *R Gaz* Sep 27-**89**; Yates' mileage card, Aug 1-**90**; petroleum, liquid fuel on *Eng* * Oct 19-**88,** working of, Urquhart * Feb 8, 15-**89,** do. tests *E News* * Feb 2-**89,** burning * Aug 25-**92,** do. Dudley *F Inst* * Aug -**88,** in So. E. Russia, Grazi & Tsaritsin R., Urquhart, discuss., insets *Inst M E* * Jan -**89** *R & Eng* * Jan -**89,** on Great Eastern R., England, Booth *R Gaz* * Feb 26-**92** *Sc Am Sup* * Nov 24-**88,** working with, Urquhart (full) * Sep 27 * Oct 4-**90.** See also LOCOMS., boilers, liquid fuel

FURNACE coal burning, Higginson *R Gaz* * Nov 23-**88.** See also LOCOMS., boilers, fire-boxes

GEORGIA Pac., 10-wheel *E News* * Apr 5-**90**

GLASGOW & So. West., pass., inset *The Eng* * Mar 1, 22 -**89**

GRAND Central R., Belgium, tank, inset *Eng* * Aug 16-**89**

GRAND Trunk of Canada, express, inset *Eng* * Dec 14, 21-**88** *Sc Am Sup* * Feb 16-**89**

GRANT works, Chic. *R Gaz* * May 15-**91,** Cicero, Ill., inset * June 17-**92**

GRAZI-Tsaritsin R., So. E. Russia, 8-wheel *The Eng* * Sep 4, 11, 11-**91**

GREAT Britain and Ireland, number *The Eng* Sep 2-**92**

GREAT Eastern R., England, express, inset *Eng* * May 4-**88,** inset * May 27-**92,** *The Eng* * June 12-**91**

GREAT Northern R., England, express *The Eng* June 8-**88** * Nov 6-**91,** insets * Dec 16, 16-**92**; of Scotland, pass., inset *Eng* * May 23-**90**

GREAT Western, England, broad and narrow gauge convertible, inset *Eng* * July 8-**92**; works, Swindon *The Eng* Nov 16-**88**; early * May 20, 27-**92**

Locomotives, HEADLIGHT, elec., Pyle's *El Wld* * Sep 27-**90,** abs. *Inst C E* v 103 -**91**; elec. *R Gaz* Nov 29-**89,** Jan 17-**90**
HIGHLAND R., Scot., standard pass., inset *Eng* * Oct 9 *R & Eng* * Dec -**91**
HISTORY, the DeWitt Clinton, G. H. Thomson, inset *Am C E* * v 23-**90**; old, the 'Sampson,' Robb *Am M E* v 10 -**89**; early, see H. Allen, v 11 -**90**; early, the steam buggy *E News* * Sep 8-**88**; early, Horatio Allen * Jan 11; the John Bull * 18; hist. of development, ed. 18-**90**; Tomlinson, Pres. addr., insets, (full) *Inst M E* * May -**90**
R & Eng * Feb - Apr -**90**; Camden & Amboy R., Norris, n * Jan -**92**; hist. of articulated, Brunner *R Gaz* Sep 25-**91** *Zeit Deut Eisenbahn;* early, Am. type and equalizing lever, Eastwick *R Gaz* * Apr 22, 29-**92**; the rail, spike and locom., Watkins *Sc Am Sup* Dec 12-**91** *The Eng* * Mar 7-**90**
HOELLENTHAL R., inset *Eng* * Feb 6-**91**
HOIST, Chic. & No. W. *R Gaz* * Feb 5-**92**
HUNGARIAN State R's, tank *The Eng* Feb 3, 10-**88**
ILLINOIS Cen. suburban, tests (full) *R Gaz* * June 17-**92**
INDIA, Sind Pishin section, Indian State R's *Eng* Apr 13 * 20-**88,** inset * Apr 19-**89,** 6-coupled, meter gauge *The Eng* Mar 23-**88**; Indian Midland tank * Nov 22-**89**
INDICATOR diags. at high speeds *E News* * June 9, compound and ordinary, comparison * July 7-**92**; indicating. Lyne, *R Gaz* * Aug 2, Manning, cor. 16-**89,** do. Dean * Feb 28; indicator cock, 4-way, Gifford * Mar 7; diags., Worsdell's high speed compound * Mar 28, No. E. R., England and ed. (and train resistance) 28-**90**
IRON Range & Huron Bay heavy frt. *E News* * June 16, 12-wheel, inset * July 7-**92**
ITALIAN pass. *R & Eng* * June -**90**; Ital. Med. R. *The Eng* Nov 9-**88,** pass. * Feb 1 * Mar 29, goods, Sep 6 * Dec 20-**89,** Paris exhib. * Feb 21-**90**
JAPAN Imperial R's tank, inset *Eng* * Feb 10-**88**
LAKE Shore & Mich. So. express, Brooks works (details), inset (full) *R Gaz* * Nov 16-**88**
LANCASHIRE & Yorkshire, England, pass., inset *E News* * Mar 28; 6-wheel frt. *R Gaz* * Jan 30; tender water-scoop * Dec 25-**91**; standard goods, inset *The Eng* * Jan 1-**92**
LONDON, Brighton & So. Coast pass. *R & Eng* Sep, express pass., Paris exhib. *The Eng* July 19, 19-**89**

Locomotives, LONDON & No. W., Crampton engine, 1847, inset *The Eng* * Nov 28-**90**; compound express * Nov 20-**91**

LONDON & So. W. works *The Eng* Sep 28-**88**; tank, inset * Feb 5-**92**

LONDON, Tilbury & So. tank *The Eng* * Nov 25-**92**

MANHATTAN Elevated R., N. Y. n *R & Eng* * Jan -**90**

MEDITERRANEAN R. *The Eng* * Mar 13-**91**

METROPOLITAN R., Lond., 4-wheel tank, inset *Eng* * Dec 18-**91**; Met. Dist. R. pass. tank *E News* * Mar 22-**90**, inset *The Eng* * May 17-**89**

MEXICAN Cen. (Fairlie system), inset *Eng* * May 14-**90**; average econ., Johnstone, cor. *R Gaz* Nov 20-**91**

MICHIGAN Cen. 10-wheel express *R Gaz* * Feb 24-**88**

MIDLAND R., England, express, inset *Eng* * Mar 2, 16-**88**, exp. pass., Paris exhib. *The Eng* Sep 20-**89**

MINERAL tank, Barry R. *Eng* * Dec 2-**92**

MOUNTAIN, two rack-rail, Abt system, Brunig R. and Riggenbach system, Brazil *E News* * Nov 9-**89**. See also RAILROADS, mountain

NARROW gauge frt., for So. Am. (meter gauge), Sharp Stewart, Glasgow *E News* * May 17; compound, Baldwin * Dec 13 -**90**

NEWPORT News & Miss. Val. 10-wheel frt. *R Gaz* * Mar 16-**88**

NEW So. Wales Gov't. R's, Baldwin 10-wheel *R Gaz* * May 29-**91** *The Eng* Nov 23-**88** (full), July 1, Oct 14-**92**

NEW York Cen. & H. R. 19 x 26 Brooks mogul, inset *R Gaz* * July 25-**90**; suburban, inset * Sep 11-**91**

NEW York, L. Erie & W. express, inset *R Gaz* * Jan 6-**88**

NEW York & Northern, Rogers works, suburban service, n *R & Eng* * Oct -**88**

NEW Zeal. Gov't. R's tank, inset *Eng* Jan 29-**92**, do. for heavy grades, inset *E News* * Nov 14-**91**

NORTH Land. R. tank goods, inset *Eng* * Oct 3-**90**, pass., inset * Jan 9-**91**

NORTHERN Pac. consolidation, inset *Eng* * Oct 25, *Sc Am Sup* * Dec 7-**89**

OLD Colony R., simple and compound, tests, tables *R Gaz* Sep 16-**92**; pass., inset *The Eng* * Nov 14-**90**

OSCILLATIONS ap., West. R. of France *Eng* * Jan 10; registering ap. *E News* * Feb 8-**90**

PENN. R. pass. *The Eng* * Oct 17, 17-**90**

Locomotives, PHILADELPHIA & Reading heavy consol. *R Gaz* * Jan 4-**89**; express * Apr 15-**92**
PIECE-work classification (full) *R & Eng* Jan - Mar -**92**
PISTON, rod breakages, report *R & Eng* * Nov; Am. balance piston *R Gaz* * Jan 3-**90**
PRUSSIAN *R Gaz* July 11-**90**
RACK rail. See LOCOMS., mt; RAILROADS, mt.
RAUB, the, n *The Eng* Dec 7-**88**
RESISTANCE, engine and ed. *E News* Jan 5, 5-**89**
REVERSE lever, Cumb. & Pa. R. *R Gaz* * May 23-**90**
RICHMOND works *R & Eng* * Oct -**90**
RUSSIAN heavy frt. *R & Eng* * Sep -**92**
ST. Clair tunnel decapod tank frt., inset *R Gaz* * Apr 3, 10-wheel *The Eng* * Apr 24 * May 29-**91**
ST. Gall & Garis mt. road R., Switz., inset *Eng* * Dec 30, 30-**92**
SANDING ap., steam *Eng* * June 29, do. *R & Eng* * Aug, do. *R Gaz* * Sep 14-**88**; Leach's sand feeding ap. *E News* * Feb 13-**92**
SAXON State R., 4-cyl. compound *The Eng* * Oct 23-**91**
SCHENECTADY works *R Gaz* * July 15-**92**
SHAY, the, Gilpin Tramway, Col. *E News* * Apr 26-**90**, inset *R Gaz* May 8-**91**
SLIDE valves, friction of, Aspinall, discuss., insets *Inst C E* * v 95 -**89** *The Eng* Dec 28-**88**; and cyls., Lond. Br. & So. C. R. Aug 23-**89**
SMOKE-stacks, and exhaust nozzles design, W. H. Lewis *E News* * June 23-**92**; cast iron *R Gaz* * Apr 18-**90**; Manhat. eleva. R. * Mar 4-**92**; straight, theory of, Snow *Sc Am Sup* * Apr 13-**89** *Am Mas Mech*
SOUTH Eastern R., England, express pass., Paris exhib., inset *Eng* * Apr 25 * May 2 *E News* * Feb 22-**90**, inset *The Eng* * Nov 29 * Dec 13-**89** * Jan 3-**90**
SOUTHERN R., Italy, goods, inset *Eng* * Oct 31-**90**
SOUTHERN Pac. R., 8-wheel, diag. *E News* * Apr 25-**91**
SPARK arresters, Bell's *R & Eng* * Mar; Brown's and smoke stack *R Gaz* * Nov 14-**90**
SPRINGS and equalizers, Master Mech's com. report *R Gaz* * June 29-**88**
STRONG, the, distrib. of steam in, Dean *Am M E* * v 9-**88**, sup. v 10-**89**; inset *Eng* * May 17, 17, cor. June 7-**89**; Strong Manuf. works * June 6-**90**; remarkable run *E News* Apr 6-

Locomotives, STRONG
89 *F Inst* * Feb -**88**; steam distrib., Dean *R Gaz* May 25-**88**; the 'A. G. Darwin,' inset * Jan 11; indic. diags. June 28 * July 26-**89** *Sci Am* Jan 12-**89**; insets * *Soc Arts Mass* -**88**; Tratman *The Eng* Sep 13-**89**
SWEDISH pass. *R & Eng* * May -**88**
SWINERTON polygonal driving-wheel *E News* May 24, Swinerton, cor. June 28-**90**
TAFF Vale R. 10-wheel tank pass., inset *Eng* * Aug 2, 9-**89**
TENDERS, Wabash R. *E News* * Dec 1-**92**; truck, U. P. standard *R Gaz* * Dec 7-**88**; axles, muck-bar, tests, Watertown arsenal, Howard (full) Jan 4; trucks, Hickey, Feb 22, Mar 1-**89**; iron frame, N. Y. L. Erie & W. * Apr 18; heavy axles, Master Mech's com. report * June 20; iron frame, Brooks works * Nov 7-**90**; hopper, Wabash R. * Nov 18-**92**
TESTS, and elec. motor, comparative tests, Manhat. El. R., Moss, insets *Am C E* * v 23-**90**; standard method, prelim. report *Am M E* * v 13; experimental, Goss * v 13-**92**, do. *E News* * May 19, 19-**92**; Penn. R. n Apr 26-**90**; expts., Donkin *Eng* * Oct 21-**92**
R Gaz trials, Manning * July 12, 19; in Chili, Stillman, Dec 27-**89**; standard method, Dean * June 20, 27; testing, Manning, July 18; the calorimeter in testing, Barrus * Oct 17-**90**; Baldwin 10-wheel, B. & O., ed. (full) * Nov 27, 27 * Dec 11-**91**
R Gaz Old Colony, table, May 27; standard, com. report (full) 27; Ill. Cen. suburban (full) * June 17; simple and compound, O. Col., tables, Sep 16; Schenec. prelim. Oct 7-**92**; Am. performance, n *The Eng* Apr 20-**88**; trials, Chili, Feb 14 -**90**; experimental, Goss * June 3-**92**. See also LOCOMS., compound; RAILROADS, speed
TIRE testing machine, Chapelle works, Paris *The Eng* Jan 6 -**88**
TRACK tanks, Balt. & O. R., Andrews *R Gaz* Oct 28-**92**
TRACTION, tractive power, diag. *E News* * Sep 7-**89**; the Ries traction increaser * Aug 9-**90**, ed. * May 9-**91**; tractive power, n *R & Eng* * Sep -**89**; how does it pull itself * Apr -**92**; tractive force and train resistance *R Gaz* * Oct 24-**90**, do. Slack *Steven's Indic* July 15-**88**; and driving, the mechanics of, R. H. Smith (full) *The Eng* * May 13 * June 3-**92**
TRALEE & Dingle R. narrow gauge *The Eng* * July 15-**92**
VALVE, Child's cyl. *R & Eng* * Jan -**89** * May -**92**

Locomotives, VALVE gears, Bonnefond's *Eng* * Dec 20-**89,** do. *R Gaz* * Jan 17; Hunt's pat. *R & Eng* * June -**90**; Rickie's, Cawnpore st. R's, India *The Eng* July 6-**88**
WABASH 10-wheel express, inset *R Gaz* * Oct 17-**90**
WATERFORD & Limerick R. *The Eng* * Sep 12-**90**
WEIGHING machine, Paris & Orleans R. *Eng* * Nov 29-**89**
WESTERN R. of France, Paris exhib. *Eng* * Oct 18; tank * Nov 22-**89**; pass., inset * June 6, 13-**90**
WOOTTEN, the, com. report *F Inst* * Sep -**91**; U. P. express pass. (boiler) *R Gaz* * June 15, details * Oct 5 *The Eng* July 6 -**88**
Lock, Havre transatlantic, iron gates, Widmer, abs. *Inst C E* v 92 -**88** *An Ponts* * v 14 -**87.** See also CANALS, locks
Lock-nut, the Cluther *The Eng* Sep 28-**88.** See also TRACK, lock-nuts
Locks, elec. applic. to, Kintner *El Eng* * Jan -**88**
Lockwood, John, n *Am C E* v 27-**92**
Lockwood, Thomas D., por. *El Wld* * Sep 14-**89**
Lodge, Oliver J., por. *El Wld* * May 9-**91,** por. *Sc Am Sup* * Nov 1-**90**
Logarithms *Pwr* Jan -**92**
Logger, steam *Sc Am Sup* * Apr 14-**88**
Logs, loading on cars, M. C. B. standard *E News* * Nov 1-**90**; new proc. for comput. of, May 5-**92**
Logwood, extracts testing, Palmer *F Inst* Apr -**89**; extractive matter of, Macfarlane, Mar -**90**
London, elec. lighting of, ed. *Eng* May 24-**89**; growth, *E News* Aug 15-**85**; July 22-**88**; water Co's remarkable hist. Aug. 17-**89**; street traffic, July 5; smoke, value of, n Dec 6-**90**; traffic, Howe report sup. Jan 2; Met. Gov't., ed. Apr 21; rapid transit * Nov 24-**92,** do., Reckenzaun *St R J* May -**91**; main drainage report *The Eng* Mar 13-**91**; new streets between Holborn and Strand, proposed, map * July 15-**92.** See also HYDRAULIC power distrib., Lond; PAVEMENTS; RAILROADS, underground; SEWERS; WATER-works, etc.
Loring, Charles A., por. *Cassier's* * Dec -**91**
Louisiana quarantine system, Holt *Sc Am Sup* * Jan 7 * Feb 4 -**88**
Loveridge, Henry, por. *E & Min* * Dec 13-**90**
Low, Thomas B. *Inst C E* v 91 -**88**
Lubbock, John, por. *Sc Am Sup* * Mar 22-**90**

Lubrication, viscosity, dets. of, Denton *Am M E* v 9-**88,** measurement of durability of lubricants, do. * v 11-**90,** expts. with, do., Bissell, v 12-**91,** self-lubricating fibre graphite for machinery bearings, Cooper, v 13-**92**; friction of, Thurston *Cassier's* Oct-**92**; J. V. Wilson *Eng* * Apr 20-**88**; anti-friction materials, Hedges, Aug 26-**92**; dry lubricants *E & Min* Aug 24-**89**; lubricating oil purifier *E News* * June 21-**90**; the Holmes lubricant bearing, com. report *F Inst* Dec-**91**; measurement of durabil., Denton *Pwr* * June; lub. oils exam., Stillman, Sep-**90** *Steven's Indic;* durabil. of lubricants, Denton *R Gas* May 23-**90**; rationale of, Snowden, Feb 13-**91**; Barr, Dec 2-**92**; lub. oils, Charlier *Sc Am Sup* Nov 29 *The Eng* Oct 17-**90**; oils, ed. Sep 18-**91.** See also BEARINGS without lubs; FRICTION and lub; GREASE; OILS

Luiz, Dom I (King of Portugal) *Inst C E* v 100-**90**

Lumber, creosote, Fernandina works, Fla. *R Gas* * Nov 16-**88**; No. western traffic, Mar 25-**92**; cutting, circular saw or band, n *Sc Am Sup* * Oct 25-**90.** See also WOOD

Lunkenheimer, Frederick, por. *Cassier's* * Jan-**92**

Lunn, Robert W. *Inst C E* v 100-**90**

Lyons, John *Inst C E* v 101-**90**

Machine, moulding, Tabor *Am M E* * v 13-**92** *Cassier's* * July; design, æsthetics in, Barr, Aug-**92**; design, Unwin, bk. review *Eng* Apr 24-**91**; designing, intuition in, Hawkins *E Mag* July-**92,** do. *The Eng* Feb 15, 22-**89**; designing, Sweet *F Inst* * Apr, do. *R Gas* * June 15, do. *Sc Am Sup* * Apr 28 * May 5-**88**; accident preventing devices, Cooper *Pwr* * Dec-**90** *Am M E* v 12-**91**; construction, Richards, bk. review *R & Eng* Nov-**89**

SHOPS, Austrian regulations for *E News* May 31; slow burning construct., Boston Manuf's Mut. Fire Ins. Co. * July 26-**90**; with weaving shed roof, Sweet * Dec 15 *Am M E* * v 13-**92**; France *R Gas* May 2; framing, Wilmerding, Pa., Westinghouse * Apr 11, June 6-**90**; Link Belt Machine Co. * Apr 24-**91**

STOKING, Spencer, discuss., insets *Inst C E* * v 104-**91.** See also STOKERS, mechan.

TOOLS, mod., Dixon *Eng* Feb 3 *The Eng* Jan 20-**88**; power used by, n *E News* July 19-**90**; indic. diags. from, Breckenridge *Lehigh Eng J* Oct-**88.** See also Shipyard machine tools, etc.

Machinery, The Mechanics of, Kennedy, bk; tight set-screws in, Cooper, discuss. *Am M E* -**88**; miscel., Roy. Agric. Show, Nottingham *The Eng* July 20; use of in construction, Price, Oct 26; sale of old, Sharp, Stewart & Co. 26-**88**; old, sale prices, July 19-**89**

Machines, accident preventing devices applied to, Cooper *Am M E* v 12 -**91** *Pwr* * Dec -**90**. See also AUTOMATIC—SLOT machines

Mackensie, John *Inst C E* v 106 -**91**

Mackintosh, Alexander *Inst C E* v 101 -**90**

Macnab, Alexander *Inst C E* v 104 -**91**

Macy, Arthur, por. *E & Min* * May 9-**91**

Magheramorne, Lord *Inst C E* v 101 -**90**

Magic lantern, optical projection, Wright, bk. review *Eng* Dec 4 *The Eng* * Nov 13 * Dec 25-**91**

Magnesite as a refractory material, Sorge *E & Min* Jan 16 -**88**

Magnetic, circuits and measurements, Du Bois *El Rev Lond* * Oct 9; induction, molecular proc. in, Ewing (full) *Sc Am Sup* * Nov 14; reluctance, Kennelly (full) *El Wld* * Nov 7, discuss. 21, (full) *El Rev* * Nov 7-**91**; fields, graphic representations, Houston * Sep 3-**92**. See also ELEC. magnetic

SEPARATORS *E & Min* * Nov 5-**92**; Paris exhib., Hering *F Inst* * June; Hall, cor. *The Eng* * July 18-**90**

BALL & Norton electro-, Ball *Am Min* * v 19-**91** *El Eng* * Oct 8, Monarch *El Rev* * Oct 11-**90**

BUCHANAN'S ore *E & Min* * Mar 10-**83** * June 15-**89**

CHASE iron ore *E & Min* * July 2 *E News* * Sep 1-**92**

EDISON'S, n *E & Min* * Dec 8-**88** *Sc Am Sup* * Jan 12-**89**

HOFFMAN *E & Min* * Dec 12-**91**

LOVETT-Finney iron ore *E & Min* * Nov 21-**91**

MONARCH ore *El Rev* * Oct 11, Ball *El Wld* * 11 *E & Min* * Sep 6, Ball *The Eng* * Dec 5-**90**

VENSTROM *E & Min* * Nov 24-**88**

WENSTROM, Cook *Am Min* * v 17 -**89**. See also IRON ore concen., Birkinbine * v 17 — mag. separators

Magnetism, relation to induced elec. mo. force and cur. E. Thomson *El Rev Lond* * June 21-**89**; Hopkinson * Jan 17, 31-**90**; and recalescence, do. *El Wld* * Dec 20-**90**; Ewing's theory of, Crew *F Inst* * Aug, Hoopes *El Wld* * May 16; elec., galvanism and the telegraph, chronol. hist., Mottelay (very

Magnetism
full) * Apr 18-**91** - Feb 27, Sep 3, pors. 10 - * Oct 22 - Dec 31 -**92**, etc.
Sc Am Sup influence upon crystallization, Decharme * Mar 31; protection of watches against, Woodbury, Oct 20-**88**; curiosities, Bidwell (full) * July 6; relation to induced elec. mo. force and cur., E. Thomson (full) * Aug 17-**89**; Hopkinson (full) * Mar 1, 8-**90**; recent prog. in Giles, Dec 26-**91**; wave propagation of, Trowbridge, July 2-**92**; Hopkinson *The Eng* * Mar 7-**90**. See also ELEC. magnetism

Magnetite, crystalline, in Port Henry, N. Y. mines, Birkinbine *Am Min* * v 18-**90**; Ontaria, Ledyard, discuss. v 20, So. W. Va., Nitze, v 20 -**92**; concentrating with Conkling jig at Lyon Mt., N. Y., Ruttmann *E & Min* * June 9-**88**

Magnets, permanent, character of steel used for, Preece (full) *El Rev Lond* * Sep 12-**90**, S. P. Thompson *El Rev* Aug 8 *El Wld* * Aug 1, 8, 22-**91**. See also ELEC. magnets—magnetism, etc.

Magnolia metal for machine bearings, R. H. Smith report *The Eng* * Dec 20-**89**

Main, John F. *Inst C E* v 110 -**92**

Malaria, malarious districts, treatment of *Eng* * Mar 2-**88**; Celli *Sc Am Sup* * June 27-**91**

Malt drying vac. stove *Sc Am Sup* * June 30-**88**

Man, evolution in civilized, Powell *Sc Am Sup* Apr 7-**88**; effects on strength of injections from liquid from animals, Brown-Sequard, Aug 10, Brown-Sequard discov., Stockwell, Oct 19-**89**; man's upward struggle, Aaron, Aug 13; cerebro-spinal axis as a thermal center and power, Richardson, Oct 1-**92**. See also MEN

Manganese, manganese-steel, Howe *Am M E* * v 12-**91** *E News* * June 20-**91**; ores, argentiferous, Tombstone dist., Ariz., Goodale (supplementary) * v 18 -**90**; ore deposits, Crimora, Va., Hall *Am Min* * v 20-**92**; steel *El Rev Lond* Aug 10, do. Hadfield *Eng* Mar 9, Sep 7, 21-**88**
E & Min Santiago de Cuba mines, Reimer report, Nov 24-**88**; the Reymert manganiferous lode, Ariz., Blauvelt, Feb 9-**89**; the Crimora mine, Va. * Mar 22-**90**; ores, U. S. produc., Weeks, Cen. bull. May 23; distrib. in No. Am., Penrose, Aug 1 -**91**; metallic, Bullock, n *F Inst* July -**89**; bronze *The Eng* * July 25-**90**

Manual training, education for the workshop, Perrine *E Mag* May; man. training-kindergartens, Plunkett *Pop Sci* July -**92**

Manufactures, time and cost keeping, Binsse *Am M E* v 9 -**88**; manuf'g industries net profits. ed. *Eng* Oct 9; practical prime cost, ed. Dec 4, 11-**91**; in U. S., growth, n *E News* Oct 11; industries stats., ed. *E & Min* Aug 2-**90**; and arts, review of prog. *F Inst* Feb -**88**; English manuf's in U. S., Siddell *The Eng* Nov 14, 21-**90**; Am., recent growth, Nov 25-**92**. See also INDUSTRIAL Co's

Maps, in relief, construct., Harden *Am Min* * v 16-**88**; mercator chart drawing on one sheet, Kelvin *El Rev Lond* * Sep 30-**92**; of ordnance survey, Scot. Highlands *Eng* Jan 6, 20 * Feb 3, 17 * Mar 2, 16, 30 * Apr 13, 27 * May * June 1, 15, 29-**88**; pocket mapping instrum., Lane *E & Min* * Apr 12-**90**

E News plotting contours, Lorimi, diag., cor. * Feb 23; making topog. relief maps, cor. 23-**89**; Gov't., scale of, in Europe, n Dec 19-**91**; topog. lettering and marking ap., n Feb 6-**92**; mapping of the world *R & Eng* June -**91**. See also MINING maps; SURVEYING, topog.

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CANFIELD'S compound *R & Eng* * Aug –**91**
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CLUTHA ferry str., trip-expan., inset *Eng* * Apr 26–**89**
FALLS of Inversnaid str., inset *Eng* * Nov 23–**88**
FURST Bismarck str., insets *Eng* * Apr 1, 22–**92**
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INDEFATIGABLE, trip-expan. *Cassier's* * Oct –**92**
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KAISER Wilhelm II str., insets *Eng* * Aug 1, 15–**90**
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LA Flandre, Belgian Roy. Mail paddle str. *The Eng* * Apr 5 –**89**

Marine ENGINES, LORD of the Isles, oscil., inset *Eng* * July 15-**92**
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METEOR str., trip-expan., performance, com. report, Kennedy *Eng* * May 10, inset * Sep 13, trials, insets, do. (full) *Inst M E* * May -**89**
MINHO str., inset *The Eng* * Aug 21-**91**
MIRA steam yacht *Eng* * Mar 18-**92**
MODJESKA twin screw str., inset *Eng* * Oct 4-**89**
MOSELLE steamboat, compound, 1840 *The Eng* * Dec 26-**90**
NAIAD, English cruiser *R & Eng* * Feb -**92** *Industries*
NEW York, cruiser, inset *Eng* * May 6-**92**
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OPHIR str., Orient liner, insets *Eng* * Nov 6, 20, 27-**91**
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Mines and mining
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ASPEN mt. ores, Col., Brunton, map (full) *E & Min* * July 14, 21-**88**; Co's elec. plant, Holt, Jan 23 *Am Min* * v 20 -**92**; notes on geol. and mines of Pitkin Cty., Henrich (full) * v 17 -**89**
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CHINA, prog., notes, Ellark *Am Min* * v 19 -**91**

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HOISTING, Koepe system of shaft winding, Harden *Am Min* v 17 -**89**; tandem water tanks for flooded slopes, Bowden * v 20-**92**; pneu. vs. cable, Wheeler *E & Min* * Oct 18-**90**

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LOW Moor, Va., mining in soft ores, Hungerford *Am Min* * v 17 -**89** *E & Min* * Oct 13-**88**

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MAPS, strata-maps, method of constructing, stratification or bedding, Ives *Am Min* v 16 -**88**

MENOMINEE Range, Mich., methods of mining in, Fulton *Am Min* * v 16 -**88**

MOULTON Hill mine, Quebec gravity plane, Falding *E & Min* * Jan 31-**91**

MOVABLE platform for inclined planes in mines, Ruidant, abs. *Inst C E* v 94 -**88**

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NOVA Scotia industry '91, n *E & Min* Oct 22-**92**

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PRUSSIAN mines '88, abs. *Inst C E* v 99 -**90** * *Zeit Berg Hut* -**89**

PUMP, mine *Cassier's* * June -**92**

ROSARIO mine, San Juancito, Honduras, C. A., notes, Leggett *Am Min* * v 17 -**89**

RUSSIA, mining '87, Kulibin, abs. *Inst C E* v 102 -**90**; and metallur. stats. '89, abs. v 109 -**92**

Mines, SHAFT sinking, through wet gravel and quicksand, Norway, Mich., Kelly *Am Min* * v 20 -**92** *E News* * Aug 8 *E & Min* * Nov 14 *E Rec* * Aug 8-**91**; by Poetsch-Sooysmith freezing proc. *E & Min* * Jan 18; through quicksand, Haase's system * June 21; Kind-Chaudron's methods * 28; freezing proc., Moran (full) *R Gaz* * May 16 *Sch of Mines Q* Apr -**90**
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SUBMARINE mining, Bucknill *Eng* Jan 6 * 20, 27 * Feb 10, 24 * Mar 9, 23 * May 11 * June 1, 15, 29, July 13, Aug 17 * Oct 5 * Nov 23-**88**
TASCO district, Guerrero, Mex., Chism *E & Min* July 13, 20-**89**
TELEGRAPH, the old, Utah, Laraguino *Am Min* v 16 -**88**
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VENTILATORS, centrif. mine, expts., Norris (full) *Am Min* * v 20 -**92**
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FEDERATED Inst. of Mining Eng'rs *The Eng* Sept 16-**92**
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Mint. See U. S. mint
Mirror, Japanese magic *F Inst* * Jan, Apr -**88**
Miss. river and Giuseppe Beltrami *Locom* Mar-**90.** See RIVERS, Miss.
Mitchell, J. E. *F Inst* Apr -**88**
Molasses distillation, Hutchinson *Sc Am Sup* Oct 10, Debremond, 17 -**91**
Molding machine, Tabor *Am M E* * v 13 -**92**
Monetary unification and universal bank scheme, Granier *E & Min* * May 17-**90**; money question, Mar 7-**91**

Monitor, as it is, cor. *The Eng* Mar 7-**90**
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Monte-jus, self-acting (fluid measuring ap.) *Eng* * Dec 12-**90**
Montreal, harbor imps. *E News* * May 2-**91**; rapid transit system proposed, Wicksteed, n * May 26-**92**
Montresor, Charles E. C. *Inst C E* v 106 -**91**
Monument, the Columbus, Barcelona, Spain *Sc Am Sup* * Dec 1, 29 *The Eng* Nov 23, 23-**88**
Monumental fountain, Paris exhib. *Sc Am Sup* * Feb 16-**89**
Moore, James M. *Inst C E* v 107 -**92**
Moore, William *Inst C E* v 97 -**89**
Morant, Ernest F. *Inst C E* v 95 -**89**
Morant, John H. *Inst C E* v 110 -**92**
Mordey, W. M., por. *El Wld* * Aug 8-**91**
Moreland, Richard *Inst C E* v 104 -**91**
Morland, Henry *Inst C E* v 106 -**91**
Morocco, (min.) wealth of, Howarth *E & Min* Apr 12-**90**
Mortars. See CEMENTS and mortars
Morton, John H. *Am C E* v 26 -**92**
Motion, graph. anal. of recip., O. Smith *Am M E* * v 11 -**90**; sensations of, A. Brown (full) *Sc Am Sup* Oct 12-**89**. See also MASS and motion
Motors, Keely, T. C. Smith *E Mag* Oct -**91**; without fuel and second prin. of thermodynamics, Mehner *F Inst* Aug -**92**; small, comparative working expenses, Korte, abs. *Inst C E* v 105 -**91**; small, es. of cost, gas and elec., Davis *Sc Am Sup* Jan 9-**92** *Am Gas Lt'g J.* See also ELEC. — GAS motors
Moulding sand, mechan. treatment of, Bagshaw *Eng* * Feb 27 -**91**
Mountains, slide, notes on a, Curtis, discuss., insets *Am C E* * v 24 -**91**; (roots of) our molten globe, Wallace *Littell's* Dec 24-**92**; White Mts., hist. *Locom* Oct -**91**; highest peaks of No. Am. *Sc Am Sup* Oct 11-**90**
Mud in Persian and Eastern architecture, Simpson *Sc Am Sup* * July 30-**92**
Muir, James *Inst C E* v 96 -**89**
Muir, William *The Eng* Aug 24-**88**
Muller, Max, por. *Sc Am Sup* * Oct 22-**92**

Mummies, Cal., W. Anderson *Sc Am Sup* Aug 25-**88**

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F Inst sts. and pavements, Haupt, Dec -**89**; Am., French opinions, Le Rond *R & Eng* Nov -**88** *An Ponts;* city refuse and garbage disposal, Foster *Sc Am Sup* * Jan 23-**92** *Eng;* munic. monopolies, Sinclair, state treatment of corp. property *Scribner's M* Nov *St R J* Oct -**91.** See also CITIES; PAVEMENTS; ROADS; SEWERS; STREETS; WATER-works, etc.

Murton, Frederick *Inst C E* v 96 -**89**

Muscular fatigue, Morso's ergograph and ponometer *Sc Am Sup* * Nov 15-**90**

Musgrave, Joseph *Inst C E* v 104 -**91**

Musical instrums., construct. and capabilities, Hipkins (full) *Sc Am Sup* Sep 5-19, new keyed for just intonation * Oct 17-**91**

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Nantes port *Eng* July 19 * 26 -**89**

Naphtha yacht Mignon, aluminum *Eng* * Sep 9-**92**

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Natural gas. See GAS, natural

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Navies (war-ships), limits of the battle-ship, Kent *Cassier's* Nov -**91**; elec. equip of mod., Hutchins * Apr * July -**92**; elec. work in, Bradford report *El Rev* * Dec 28-**89**; elec. light plant management on warships, Jan 24-**91**

Eng warships of the future, Albini, Aug 24-**88**, armor of, Barnaby, Apr 12, machin. of, ed. Aug 9; coaling the navy, July 19-**89**; warships of world, Aug 22; protection of ships, Barnaby, Dec 12-**90**; building, future policy, Brassy, Mar 20, 27; Armstrong builder * July 31-**91**; electricity in, Hamilton, May 6; dimens. of warships, Wilmot, July 8; the Ward ram * 15; electricity in, Deadman, 29, Aug 5-**92** *Inst M E*

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Navies

Dec 7-**89**; naval warfare, 1860-89, Clowes, Oct 18; the first monitor, n 25-**90**; Purdy's twin warship * Feb 21; navies of world, relative strength, n May 2; armor plating, France and Great Brit. * Oct 3-**91**

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Navies, GREAT Britain

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Navies, UNITED States
Chicago * Aug 22, speed trial data, note, Mansel, Oct 10-**90**; cruiser Maine * Jan 9; Biles * Mar 27, 27 * Apr 3; cruiser Yorktown * Mar 27 * Apr 24; navy exhibit, Columb. exhib., insets * Dec 4, 11-**91**
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Nicoll, Donald *Inst C E* v 108 -**92**

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CYLINDER *Sc Am Sup* Jan 16-**92** *Chem Tr J*

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Ore

Dougherty, Feb 8; deposits, isochemic lines in, Browne * Apr 19; deposits and mines of Minas Geraes, Brazil, Mezger, Raymond, Aug 30, Sep 6-**90**; deposits of Pioche, Nev. Feb 7; supply for Vir. furnaces, Pechin, Mar 14, 21, cor. 28-**91**

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Pagan, John *Inst C E* v 96 -**89**

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Pavements

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Peacock, Richard *Inst C E* v 97 -**89**
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Pearce, William *Eng* Dec 21 *The Eng* Dec 21-**88**
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Penny, Alfred *Inst C E* v 101 -**90,** 107-**92**
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Perkins, George L., por. *R Gas* * Aug 3-**88**
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Petroleum
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BRAYTON, the *Cassier's* * Aug *Eng* * July 15-**92**
BUTLER'S motor *The Eng* * July 25-**90**
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TRUSTY, the, n *Eng* * Dec 2, portable *The Eng* * Dec 9-**92**
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Philbrick, Edward S. *E Rec* Feb 23-**89**
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Phipson, Wilson W. *Inst C E* v 108 -**92**

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Phosphates, slag, Phillips *Am Min* v 17-**89**; commercial, list of, Adams, v 18-**90**; indus., n *E Mag* Aug *E News* July 18-**91**, of Fla., Wilson, insets *E Mag* * Oct -**92**, do. beds, Ledoux *E & Min* Feb 8, notes, Wyatt, Aug 23-**90**; So. Car. phos. rock market '90, Jan 3; deposits, Fla., notes on geol. of, Darton, Feb 14, do. origin and deposition, Davidson, May 30; of Am., Wyatt, bk. review, Nov 14; Fla. fields, notes, Adams, 21, 28, Dec 5, 12-**91**, do. U. S. produc. '91, Jan 2; Fla., mining, do. * 23 * Feb 13, Pratt, Apr 2; So. Car., mining, Benedict * Mar 26; beds of Maltese Islands, Cooke * Aug 27-**92**

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F Inst recent advances in, Ives, May; chlorophyl and gelatine-bromide plates, do. * June; substitute for glass, Carbutt, Dec -**88**; heliochromy, Ives, Jan, n Nov; amateur, in its educa-

Photography

tional relations, Himes, May; substitution of gelatine for collodion, com. report, Sep; lenses, focus of, Cheyney * Nov -**89** * June; proc. without metallic salts, Dec -**90**

F Inst in the colors of nature, Ives, Jan; heliochromy, Prof. Lippimann's, do. Aug -**91**; *Locom* Sep -**89**; in natural colors, Feb -**90**; surfaces feebly sensitive to light, Osborne *Sci Am* Jan 19-**89**

Sc Am Sup platinotype proc., Gunther, Jan 21, Willis, May 12; gold and silver salts making, camera, Feb 4; plates, flex. substitutes for * May 5, manuf. * 26 * June 9; stereoscopic * 9; stellar, Holden, July 28; transferring and coloring, on glass, Ashman, Aug 4; negatives, Rau, 11; notes, Sep 8; instantaneous, Howland, Oct 6; notes, 6, 13, objectives, Bausch, Nov 3, 10, Dec 8; printing plates, Nov 17-**88**

Sc Am Sup engraving on glass, Duchochois, Jan 26; the inventors of * Feb 16; lenses, Beck * Mar 30; the law and, Cooper, Apr 20; making dry plate emulsions, Lyon, May 4; orthochromatic, Litzkow, Aug 17; aut. ap. * Dec 21; heliochromy (colored pictures), Oct 5, Ives n *F Inst* Nov -**89**

Sc Am Sup pictures distorting, Wallace, Mar 1; platinotype printing, Mar 1; composite, Batut * Apr 5; a new photographic eye, Flammarion, May 3; ap., Lick observ., Holden * Aug 16; image, Meldola, Sep 13; the Primuline printing proc. Dec 20 -**90**

Sc Am Sup tele-photog. (elec. transmiss. of pictures), Sutton * Jan 24; in colors of nature, Ives * Mar 14; in aniline colors, Green, May 2; aut., Enjalbert ap. * 30; work of Herschel and Fox Talbot, Lang, Aug 15; postage stamp photos. * 15; printing processes, Bothamley, 15; applics. of, Rayleigh * 29; upon a black background * Oct 24, 31; photographic chemistry, Meldola (full) Oct 24, 31, Nov 7; kite * Nov 7-**91**

Sc Am Sup telescope lens, Dallmeyer * Apr 9; notes * May 7; composite heliochromy, Ives (full) July 2; photos. untrustworthiness * Dec 17-**92**; of solar prominences, Hale *Tech Q* Nov -**90**

The Eng Crystal Pal. exhib. Mar 2, 9-**88** * Apr 5, 19 * May 10-**89**; Marion & Co's works, Apr 20, May 4; Swain's photozincographic works, June 8-**88**; B. Edwards & Co's photographic dry plate works * Mar 8-**89**; in natural colors, May 29, June 12; illum. of developing rooms, Aug 14: recent aids

Photography
to science, Sep 18, Oct 9-**91**; Camera Club conference * Mar 25; photos. (distortion) * Nov 4; curious phenomena and applics. Dec 16-**92**. See also CHRONOPHOTOGRAPHY
KINETOGRAPH, the Edison *El Eng* * June 24-**91**, Lathrop *Harper's W*
Photo-etching, intaglio plates, method *Sc Am Sup* Dec 28-**89**; on copper plates, Nov 1-**90**
Photogrammetry *Sc Am Sup* * June 15-**89**
Photo-intaglio proc., Levy, inset *F Inst* * Nov -**92**. See also PHOTO-etching
Photo-lithographic transfers, Wilkinson *Sc Am Sup* May 11 -**89**
Photo-mechan. processes, Koehler (full) *Tech Q* Oct -**92**; Waterlon's mechan. works *The Eng* Oct 5, 5, 19-**88**
Photo-micrography, imps. in, Zeiss ap. *E News* * Jan 2-**92**; Pringle *Sc Am Sup* Oct 4-**90**
Physicians to Crown Prince of Germany, pors. *Sc Am Sup* * Feb 4-**88**
Physical, National laboratory, Webster *El Wld* Aug 6-**92**; ap., economical, Ince *Sc Am Sup* * Dec 13-**90**; science. See also GRAVITATION; MOUNTAINS; OCEAN; SCIENCE
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Physiology of good and evil, Richardson *Sc Am Sup* Dec 14 -**89**
Piercy, Benjamin *Inst C E* v 96 -**89**

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Inst C E compressed air foundations, Rochelle, La Pallice har., Thurninger, abs. v 100 -**90** *An Ponts* * Nov -**89**; No. and W. coast, Scot., Barron, inset *Inst C E* * v 99 -**90**; subaqueous part of, method of construct., Kidd * v 105 -**91**; and pile abutments, Jameson *R & Eng* * Feb -**90**; promenade pier, St. Leonards-on-sea *Sc Am Sup* * June 23 *The Eng* May 11, 11-**88**; at Brighton * Jan 29 * Feb 12, old chain pier * Mar 4-**92**. See also BRIDGES; HARBOR eng; PILES; TRESTLES

Pig-iron. See IRON, pig-iron

Pile-driving, uniform practice in, Crowell *E News* Dec 29-**88**, (full) * Oct 27, Nov 3, 17, discuss., inset (full) *Am C E* * v 27, 27 -**92**; factors of safety *E News* Dec 29-**88**, ed. Apr 6; formulas, Trautwine, cor. Mar 16, May 11; South st. bridge, Phila. * Oct 19, 19: cost of, Baker, Dec 14-**89**

E News and ditching plant, Om. & St. L. R., inset * Aug 16 -**90**; formulas, Husten, cor. and ed. Aug 25; safe load for piles, ed. Nov 17; pile-driving experience, Howe cor. Dec 8-**92**

E Rec pile driver and adjustable derrick * Nov 9-**89**, revolving hydr. * Apr 4; driving, Adams, July 25; a pendulum pile driver * Dec 5-**91**; driving, Jameson *R & Eng* Oct -**89**; triple row driver *The Eng* * May 8-**91**

Piles, allowable load on, Haagsma, cor. *Eng* May 6; pile and trestle timber structures, Western Am. R's, inset * 20-**92**; safe bearing load, formulas, Trautwine, cor. and ed. *E News* Dec 29-**88**, Jan 19-**89**; sinking, jet and screen dike, Missouri river com. * Dec 6-**90**

E Rec pile bridges cost of repairs, Talbot Sep 20-**90**; abutments and piers, Jameson *R & Eng* * Feb; preservation, Mc Intosh, June -**90**; safety of pile bridges *R Gaz* Apr 26-**89**, and trestle, Minneap. & St. Louis, Hixon, cor. * Apr 17, deep water R., Halifax har. * Dec 25-**91**; protection (cost), Pritchard *Sc Am Sup* Mar 1-**90**. See also BRIDGES; BUILDINGS; FOUNDATIONS; HARBOR eng; PIERS; TRESTLES

Piling, sheet, clamp for, Emery, inset *Am C E* * v 20 -**89**; Wakefield's sheet *E News* Mar 1, Harris cor. * 22-**90**

Piles, SCREW piles, in Germany *E News* * May 26; for bridge piers, Spring * Aug 4, cyl. pier sinking * Sep 8-**92**

Pill-picker machine *The Eng* * May 24-**89**

Pilot chart of No. Atlantic ocean, Hayden, map *F Inst* * Apr * June -**88**

Pinchin, Robert *Inst C E* v 95 -**89**

Pins, fibre stain in, J. B. Johnson *E News* * Jan 28, Du Bois, cor. Mar 10; strains in, Fowler, cor. * 24; and eye-bar proportions, Stowell, 31-**88**

Pipe-joints, steel, for spiral weld *E News* * May 31; lead, calking, Aug 30; Holmes' flexible * Nov 22-**90**; the Fenney cutting machine * Feb 21-**91**; cast iron water pipe cement joints, May 5 * Sep 8-**92**

Pipes, securing brass flanges to copper, Nagle *Am M E* v 9 -**88**; equation of, table *Cassier's* Nov -**91**; fittings moulding in U. S., Forbes *Eng* * July 20-**88**; water flowage in, Airy * Jan 4, 11; air vessels on, M'Creath * July 5-**89**; Pott's labor-saving fittings *E & Min* * Mar 7-**91**

E News and pipe flanges dimens., Codman * Jan 12-**89**; computations, Cox, diag. * Dec 22; measurement vel. of air in, Donkin, 22 *Inst C E*; hot water, india rubber, durability, Belleroche, abs. v 110 -**92** *Rev Mines* v 18 -**92**; cast iron, indus. in U. S. *E Rec* Mar 26; steel, specs. Dec 24-**92**; wrt. iron and boiler tubes, dimens., table, Morris, Tasker & Co. *Locom* Jan-**89**. See also GAS — SEWER — WATER pipes, etc.

Pittsburg, stats., Ricketson *Am Min* v 19 -**91**; *Eng* Oct 24 -**90**

Pivot bearing (footstep), friction, expts., report *Eng* Mar 27 * Apr 17-**91**

Planimeter, polar, novel applic., Emery, inset *Am C E* * v 18-**88**; polar, Gieseler *Sc Am Sup* * Mar 17; spherical, H. Shaw * Nov 3-**88**

Planing machines, plate edge, Forth bridge works *Eng* * Dec 14 -**88**; Sellers', Paris exhib. * Mar 14-**90**; double-acting tool rest *The Eng* Nov 9-**88**

Plante, Gaston, pors. *El Wld* * June 22 *E & Min* * 29 *Sc Am Sup* * July 13-**89**

Plants evolution, Coulter *Sc Am Sup* * June 16-**88**

Plaster of Paris manuf. and use *Sc Am Sup* Mar 21-**91** *Chem Tr J*

Platinum, electro-dep., Wahl *El Eng* July 16 *El Rev Lond* July 11 *El Wld* June 28 *F Inst* July, (full) *Sc Am Sup* Nov 22 *E & Min* June 21-**90**; metals (full) June 29-**89**; n Nov 29-**90**, Jan 3-**91**; *E News* Dec 20-**90**; and gold indus. of the Ural, Laurent, abs. *Inst C E* v 105 -**91** *An Mines* v 18-**90**; *Sc Am Sup* Nov 23-**89**; prep. and es. of pure, Mylins, Oct 29-**92**

Playing cards manuf., Chilon (full) *Sc Am Sup* June 29-**89**

Plumbing *E Rec* * Feb 4, 18 * June 9, 16; N. J. law, July 7 * 14, N. Y. specs. 21, Toronto, 28; Sep 1, 29, Nov 24-**88**; Boston Custom-house, May, June; Chic. regulations, Oct 26; N. Y. Cty. Court-house * Dec 21-**89**; Turn Verein building, N. Y. * Feb 8, 15; and drainage specs., N. Y. city, Apr 19, 26, May 3, 10; Boston law, June 21-**90**; St. Louis, Mo. inspection, Apr 4; Madison Sq. Garden, N. Y. * 11; Birm., Ala., practice (rules) * June 13; in 72d st. houses, N. Y. * Nov 14-**91**; Chic. ordinance, Feb 13; Fifth Ave. theatre, N. Y. * July-Sep; Suffolk Cty. Court-house * Sep, Oct -**92**

Pneumatic, hoisting, Wheeler *Am Min* * v 19 -**91**; dispatch, Wildemann system *Eng* * Nov 13-**91**; tool, MacCoy's, com. report *F Inst* July -**89**; pumping ap. *Iron Age* * Dec 8; dispatch improvements *Sc Am Sup* * Feb 27-**92** *Eng*; tubes, Postal telegraph system, Great Brit. *The Eng* * Dec 18-**91**

Pneumonia, M. Smith *Sc Am Sup* Dec 1-**88**

Pole road locomotives *E News* Mar 2-**89**

Police signalling, Morgan's aut. elec. system, Hill *El Rev Lond* * Mar 7-**90**

Pollard, Thomas S. *Inst C E* v 99 -**90**

Polygons, regular, graph. construct., Weihe *Lehigh Eng J* Feb -**89**

Pompeiian house of Pansa, restoration *Sc Am Sup* * Nov 8 -**90**

Population, the world's, n Eng p 458, Oct 16-**91**; finding the center of, n *E News* June 15-**89**. See also under names of countries, cities and places

Porcelain, manuf. in France *Eng* * Jan 17, 24 * Feb 7, 21 *Sc Am Sup* * Mar 22, 29-**90**; English china, Bayley, abs. Apr 7; manuf. possibilities, Elbers *E & Min* Feb 25-**88**

Portable engines and boilers. See BOILERS — ENGINES, portable

Porter, John A. por. *E & Min* * Sep 26-**91**

Post, penny, jubilee, ed. *Eng* May 23-**90**

Postal telegraph, Great Brit. (full) *The Eng* * Dec 18-**91**

Posts, yellow pine, new formula for, proposed, Stanwood *Tech Q* Apr -**92.** See also COLUMNS

Posture and its indications, Lander-Brunton *Sc Am Sup* * Aug 13-**92**

Potash, report, Payne *F Inst* Dec -**92**; yellow prussiate *Sc Am Sup* Aug 11-**88.** See also CHEMISTRY, potash

Potter, William A. *Inst C E* v 91 -**88**

Potts Arthur *Inst C E* v 96 -**89**

Potts, Frederick A., por. n *E & Min* * Nov 17-**88**

Powder. See EXPLOSIVES, cake — gun powder

Powell, John W., por. *E & Min* Jan 30-**92**

Power, measurement of, Gray *Am M E* * v 13 -**92**; hot air and steam for *Cassier's* Nov -**91**; large units, economic limit of *Eng* Dec 4-**91**; supply at Liverpool, Feb 12-**92**; plants for hydr. *E News* Aug 23-**90**; river Rhone, util. of motive power at Geneva, Powles, inset *Inst C E* * v 96 -**89.** See also DYNAMOS; ELEC. motors — power transmiss; HYDRAULIC; NIAGARA Falls util; POWER transmission; RAILROADS, elec. power stations

Power meter *El Rev Lond* * July 22-**92**; and indic., Waite *El Wld* * Mar 15-**90**

Power transmission, Hering *Cassier's* Apr; rope drive for, Grimshaw * July; variable speed, Spaulding *El Rev* * Dec 24-**92**; by water and air, Donaldson *Eng* Mar 16, Hanssen, cor. Apr 27, May 11, 18-**88**; pneu. distrib., Lupton, Sep 12-**90**; elec Feb 20, 27, Kapp, Mar 6, and hydr., Blaine, May 22, June 5 Shaw's transmitter * Dec 25-**91**

E News util. of Niagara n Nov 29-**90**; Hering, Mar 19 *Pwr* Apr -**92**; elec., Sprague *F Inst* * Mar * Apr -**89**; to great distances by compressed air, Unwin *Inst C E* * v 93 -**88**; rope *Sc Am Sup* * Mar 24-**88**; by manila ropes, Gregg * May 24; Shaw's coil friction transmitter * 31 *The Eng* * Apr 18; *J Assoc E Socs;* rope for *St R J* * Apr * Sep -**90.** See also BELTING; COMPRESSED air; DYNAMOS; ELEC. motors — power transmiss; HYDRAULIC; RAILROADS, elec. power stations; ROPE driving; WIRE rope

Precious stones, produc. '91, Kunz *E & Min* Jan 2-**92**; Kunz *F Inst* Sep, Oct -**90**; and diamond cutting, do. *Sc Am Sup* July 11-**91**; in last decade, do. (full) *Soc Arts Mass* -**88**

Preservaline, for meat, Terne *Sc Am Sup* Feb 6-**92** *F Inst*

Presses, power press problems, O. Smith *Am M E* v 9 -**88**; foot press, n *Eng* * Mar 13-**91**; drop, foundations for, Gorham Mfg. Co., Prov., R. I. *E News* * Feb 22-**90.** See also FORGING — PACKING — PRINTING presses

Pressure gauges, for high pressure gases, Budenberg *Eng* * Jan 29-**92**; open mercury column for high pressures, Bird *E News* * July 19-**90**; mercurial, on Eiffel tower *E Rec* May 23-**91**

Prices, regulation, legal theories of, Hadley *R Gas* Aug 12-**92.** See also FOOD; LABOR and names of articles

Priestley, Joseph, por. (full) *Sc Am Sup* * May 4-**89**

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CROYDEN water-works, compound, inset *The Eng* * Aug 29-**90**

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EATON water-works *The Eng* * Dec 30-**92**

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MONTREAL water-works, cost of pumping '89 *E News* Dec 6-**90**
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PETERSHAFT underground, inset *Eng* * Oct 19-**88**
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Railroads

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BOYDEN power, tests *E News* Feb 2, B. & O. 9-**89**; driver gear *R Gaz* * Aug 14-**91**; air brake testing ap. * Sep 30-**92**

Railroads, BRAKES, EAMES vac., in 'Catechism of Locom.,' Forney, bk. *R & Eng* * July -**89**; *Sc Am Sup* * Apr 21 *The Eng* Mar 16-**88**

KANE'S *Sci Am* Feb 16-**89**

MANOMATIK momentum, the *R Gaz* * Mar 23-**88**

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WESTINGHOUSE frt. train *Eng* * Mar 9-**88**; Belgian trials * Oct 17-**90**; German, Baden State R's., Kapteyn's ap. *E News* * Apr 20-**89**; frt. train test, effic. record of, July 12; rigging, Parke, Dec 20-**90**; R's equipped with, inset map * May 2; tests in So. Australia, Aug 1, frt. train, New So. Wales, 15-**91**; rack tests for, Apr 28, May 5; air pump and valve * Dec 29-**92**; 'Catechism of Locom.,' Forney, bk., inset *R & Eng* * Mar - May -**89**

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BRAZIL *E News* Mar 30-**89**; map *R Gaz* * Dec 28-**88**

BRIDGES. See BRIDGES, names — railroad

BRIGHTON jubilee, England *The Eng* Sep 25-**91**

BROOKLYN bridge, N. Y., terminals, com. report and ed. *R Gaz* * Apr 27-**88**; traffic capac. (full) * Mar 28 * Apr 4-**90**; terminus report * Jan 16; passengers carried, diag. *St R J* * Sep -**91**. See also BRIDGES, Brooklyn

BUFFER, Westinghouse friction, tests *E News* * Mar 1-**90**; Webb's hydr. stop * Jan 24-**91**. See also R. bumper

BUILDINGS, Macon & Birm. standard, inset *E News* * May 26-**92**; structures, use of wood in, Jameson *R & Eng* fences * Feb, cattle guards * Mar, watchmen's houses * Apr, section h's * May * June, small stations * July * Aug - Dec -**89** * Feb - June * Aug - Oct * Dec -**90** * Jan * Feb -**91**

Railroads, BUILDINGS
R Gaz Berg, watchman's shanties * Aug 15, section tool h's * 29 * Sep 12, h's for employees * 26, reading and club rooms * Oct 3, 10, snow sheds * 17, signal towers * 24, ash-pits * Nov 7, sand h's * 28, oil storage * Dec 19-**90,** ice-houses * Jan 9, water stations * 23, car sheds * Feb 6, oil mixing * 27 * Mar 13 -**91**
BUMPER post, Jameson *R & Eng* * Mar -**89.** See also R. buffer
BURMAH - Siam - China proposed *The Eng* Apr 27, May 4-**88**
CABLE. See CABLE railroads
CALEDONIAN, English, notes *E News* * June 20-**91**
CALIFORNIA *R Gaz* July 22, Gray, cor. Aug 26-**92**
CAMDEN & Amboy, origin and early hist. *E News* Dec 12-**91**
CANADA, ed. *Eng* Oct 16-**91**; and U. S. '87 *E News* June 16-**88**; stats. July 27-**89**; and No. E., early, map * Aug 4; stats. n Sep 1-**92**; and canals *The Eng* Nov 9-**88**
CANADIAN Pac., Keefer, Pres. addr., inset map (full) *Am C E* * v 19 -**88**; T. K. Thomson *E Mag* * Dec -**91**; location through Rocky mts., profile diag., cor. *E News* * May 26; Sep 22, 29, Oct 13, 27, Nov 10-24, Dec 15-29-**88**; Province of Manitoba, Jan 5; arch culvert plans * Apr 6; report, May 25; minor structures timber works, inset * Dec 14-**89**; report and ed. *R Gaz* May 24-**89,** June 6-**90**; Keifer, abs. July 6-**88,** (full) *Sc Am Sup* * Feb 9-23-**89**
CARRARA-Marble District, Sheiber, inset *Inst C E* * v 103 -**91**
CARS and carriages. See CARS and carriages
CATTLE-guards, the Merrill *E News* * Apr 19-**90**; tests, Indianapolis, Dec 5-**91**; cor. * Jan 9; aut. surface * Nov 3-**92**; Jameson *R & Eng* * Mar -**89**; Iron surface, Nat. Surface G. Co. *R Gaz* * Feb 7-**90**
CAUCASUS & Cen. Asia, Abraghamson *R Gaz* Sep 30, abs. *Inst C E* v 109 -**92**
CENTRAL Am. interoceanic, map *Eng* * Aug 19, 26 * Sep 16-**92,** *R Gaz* Jan 30-**91.** See also RAILROADS, Pan-Am.
CENTRAL Pac. and Union Pac., driving last spike, Dillon *R Gaz* * July 29 *Scribner's* * Aug -**92**
CEYLON, n *E News* Feb 2-**89**
CHARGES in different countries, ed. *R Gaz* Mar 28-**90**
CHEAPEST in world, Pew *Am C E* * v 23-**90.** See R's, Dublin & Wrightsville, Ga

Railroads, CHEMISTRY applied to R's, C. B. Dudley *R & Eng* Dec -**89** - Feb, Apr - Dec -**91,** Jan, Feb, Apr - June, Sep * Dec -**92** *R Gaz* Jan 3-**90**

CHESAPEAKE & O. notes *R Gaz* Jan 8-**92**

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CHICAGO, Bur. & Q. report. report abs. *R Gaz* Mar 22-**89,** Apr 4-**90,** ed. Apr 8-**92**

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CHILI, projected *E News* Nov 10; No. & So. Am. Construct. Co., map * Dec 8-**88**; Mar 9-**89**; Jan 18-**90**; Lockett *R Gaz* * Nov 23-**88**; system, Conn (full) Oct 24-**90**

CHINA, first *E News* Dec 22-**88**; Sep 21, Nov 30-**89**; No, China and collieries, Kinder *Inst C E* * v 103 -**91**; Formosa Gov't. R., Matheson, abs. * v 109 -**92**; *R & Eng* Jan -**92**; *R Gaz* July 13-**88,** n * Feb 14-**90**; Kinder, Apr 10-**91**; (first) Tientsin & Kaiping *Sc Am Sup* Feb 9-**89**

CINDER loading plant, Cin. Wash. & Balt., Evans *E News* * Aug 30-**90**

COAL-chutes, Jameson *R & Eng* * Aug * Sep -**89**

COLOMBIA, in *The Eng* Nov 2-**88**

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CONGRESSES, internat. *R & Eng* Jan -**88,** Roll, Dec -**89,** Jan **89,** Jan -**90**; Milan, Cerbelaud, abs. *Inst C E* v 92 -**88** *Soc Ingen Civils* Nov -**87**

CONSTRUCTION, location with taper curves, Olmstead *E News* * July 21, 28; earthwork comput. formula, diag. * 28, ed Aug 18; from preliminary to track, Paret, Aug 11-25, Sep 1; a cross-section mnemonic, Echols, Sep 29-**88**; econ. of timber consumption for R's, Tratman, Nov 2; standard retaining wall, N.Y. Cen. * 30-**89**; location, Wellington * Jan 25, Feb 8; proper frog location, Avery * Mar 22-**90**; news and notes *E News* files. See also R's, curves — location — U. S.; TRACK, etc.

Railroads, CONTINUOUS, Silsbee's multiple dispatch, Schmidt *Eng* * Jan 9-**91**. See also R's, sidewalk
CORPUS Christi & So. Am. *E & Min* Sep 20-**90**
COSTA Rica, n *E News* * Feb 16-**89**
COUPLERS, U. S. R's equipped with M. C. B. aut., inset map *E News* * Apr 25, 25-**91**. See also CARS, couplers
CROSSINGS, of great rivers, location, Zdziarski *R & Eng* * Aug - Nov -**92**; grade, abolition in Mass., ed. June 27, Mass. law, July 25-**90**
BUFFALO grade, prob., Guthrie *R Gaz* * May 6-**92**
CHICAGO grade *E News* * Sep 22-**92**; Stewart ave. (complicated) *R Gaz* * Apr 24-**91** * Jan 29-**92**
COMPLICATED, Minn. & St. Louis *E News* * Dec 28-**89**; N. Y., Prov. & B. * Apr 26; Penn. R. * Mar 15-**90**; Chic., Stewart ave. *R Gaz* * Apr 24-**91** * Jan 29-**92**
FONTAINE continuous *R Gaz* * June 19, (details) * Dec 18 -**91**
GRADE, who should pay for the abolition of, Mass. R. Commiss. reports, ed. *E News* Aug 4-**88**; abolition in Mass., ed. *R Gaz* June 27, Mass. law, July 25-**90**. See also R's crossings, Buf. - Chic. - Worcester, etc.
MASS. R. Commiss. report, ed. *E News* Feb 23-**89**
MOVABLE point, Wharton R. Switch Co. *E News* * Dec 14 -**89**
WOODLAWN, N. Y., N. Haven & H. *E News* * Jan 24-**91**
WORCESTER, Mass. grade, prob. at *E Rec* Apr 30-**92**
CUBAN, operating expenses *E News* June 23-**88**
CULVERTS, standard box and road beds, Kan. C. & Om. *E News* * Mar 3; pipe, 31-**88**; wooden box and cattle-guards, Or. Pac. standard * Jan 12, pile and box drains * 19; plans, Can. Pac. * Apr 6; arch, I. D. & S. * June 8; and cattle-guards, Can. Pac. * Aug 24, B. & M. * 31-**89**; R. maintenance requirements, Swift * May 30 * June 6, 13, 27-**91**; Jameson *R & Eng* * Apr -**89**; Ind., Decatur & Springfield, Hill *R Gaz* * May 25-**88**; pipe, 'Plant' system, Howe * Apr 24-**91**
CURVES, transition, Cain *Am C E* * v 26, method of running in. Ward, v 27 -**92**; resistance expts., ed. *Eng* Sep 23-**92**; safety and anti-friction device, Pendleton *E & Min* * Apr 12-**90**
E News easement, rules for, Young, cor. Aug 18; field notes, best form, Burgess, Sep 22-**88**; Echols, cor. * May 4-**89**; a 24° curve on trestle, Paddock * May 10; sharpest in use, Hill.

Railroads, CURVES
July 12-**90**; transition, locating, Hughes, cor. * Dec 29-**92**; easement, Frescoln *Lehigh Eng J* Feb, location of, F. P. Spalding, Oct -**88**
R & Eng transition or easement, Jameson * May - July -**89**, Philbrick, Riffle, cor. * June -**90**, Echols * Oct -**92**, Gieseler, *R Gas* Jan 4, Feb 8, Mar 22, Beahan, cor. * May 31-**89**, Talbot, July 31-**91**, C. Allen, May 27; resistance, Banderali, Oct 7-**92** *Eng;* curve ranger, Trotter *Sc Am Sup* * Jan 11-**90**. See also CURVES; INSTRUMENTS
CUTTING cross-section area, method of cal., Breakell *Inst C E* v 104 -**91**
DECAUVILLE portable system, Paris exhib. *Eng* * May 3 * June 7, 14, *E News* * June 1, and rolling stock *The Eng* * May 24-**89**, working results, Jan 24-**90**
DEMURRAGE, St. Paul-Minn. Assoc. and ed. *R Gas* Jan 29, 29 -**92**
DENVER, Col. Canon & Pac. project, Stanton *E News* Aug 17, inset * Sep 21, and ed. (full) * Oct 18, 18-**90**
DUBLIN & Wrightsville, Ga., cheapest in world, Pew, discuss., insets *Am C E* * v 23 -**90** *E News* Aug 9-**90**
EARLY, horse power and sails on *E News* May 11-**89**
EARNINGS and dividends, ed. *R Gas* Sep 28-**88**
EARTHWORK. See EARTHWORK
EAST Tenn., Vir. & Ga. report *R Gas* Nov 13-**91**
EGYPT, Kupka, *Eng* * June 5-**91**
ELECTRIC, elec. working of, limitations of steam and electric. in transport., Hall *Am M E* v 11 -**90** *E News* July 12, 12 *R Gas* May 23, 23-**90**; as applied to steam roads, Dashiell *Am M E* * v 13 -**92** *Cassier's* * May -**91**; coming development, Sprague, Nov *El Wld* June 18 *E News* July 7, 14-**92**
El Eng munic. rap. tran. by, Sprague (very full) Aug, discuss. (very full) *El Rev* * July 21, do. *El Eng* Nov; st. R's in Am. (list) Dec -**88**, Jan, Mar-Dec; Mansfield, Sep, table *El Rev Lond*, Aug 30 *El Rev* 17 *R & Eng* Oct -**89**
El Eng st., interference with telephone service, legal decis. Mar; st., Sprague, Mar *El Rev* Mar 8, (full) *El Wld* Feb 22 *St R J* Mar; social side, Martin *El Eng* Apr 2 *El Wld* Mar 22, (full) *Sc Am Sup* May 3 *St R J* Apr; tramway data, Hutchinson *El Eng* Apr 16; evolution of, Wetzler, 23 *El Rev* 26; single and double trolley systems, Mansfield, May 17.

Railroads, ELECTRIC

table *El Rev Lond* Aug 30 *El Wld* 17, addr. *E News* July 13, *The Eng* Sept 6 *El Eng* May 7; limitation of steam and electric. in transport., Crosby (full) 28, (full) *El Wld* 31; traction data, Reckenzaun *El Eng* * June 18 *El Wld* * 7; underground system, Wheeler *El Eng* * Sep 24; mo. power, technically considered, W. Allen, com. report, Oct 22 *El Rev* 25; overhead line construct. *El Eng* * 29; Harding conduit system * Dec 3-**90**

El Eng hist., stats., Pope, Jan 28, (full) *El Rev* 31, notes *El Wld* 31 *St R J* Feb; overhead construct. *El Eng* Jan 28; high speed work, Crosby report (full) * Mar 11, discuss. * 18, (full) *El Rev* * 14, (full) * 14, discuss. * 21, (full) *St R J* * Apr; construct. and op., Field *El Eng* * Sep 16, (full) *St R J* Oct; three years' development, Griffin *El Rev* 19 *El Wld* 19 *St R J* Oct *El Eng* Sep 16; standards, Crosby, Oct 28; the dependent overhead or underground system, Mansfield, 28 *St R J* Nov; most econom. power, tables, Badger report *El Rev* 31, (full) *El Wld* 31 *E News* 24 *El Eng* Oct 28-**91**

El Eng construct., McCay * Jan 6, Feb 24, overhead wire, Peck * Mar 2 *El Wld* * 5; engines, high and low speed, comparative tests, Wason *El Eng* 9, Serrell, 23, Wason, Apr 27; future development, Sprague, June 15-29, July 6, (full) *El Rev* Aug 13 *El Wld* June 18 *R & Eng* Sep *St R J* July, Aug; series elec. traction propul. system, Perry, Leonard *El Rev* * 18 * July 2 *El Wld* * 18, 18, Dec 3, 10, 24 *St R J* * July *El Eng* * June 15; a model roadbed and underground wiring, Baumhoff report, Oct 26, (full) *El Wld* 29 *E News* 27; machine shops econ., Bickford, com. report *R Gaz* 28 *St R J* Nov *El Eng* Oct 26; elec., horse and cable, relative cost of op., Ramsay, com. report, 26, tables *El Rev* 29 *El Wld* 29 *R Gaz* 28 *St R J* Nov; resistance of return circuits, Warner, *St R J* * Dec *El Eng* Nov 7; and elec. light plants op. from same station, McCay, Dec 28-**92**

El Rev Lond overhead wire strains, tables for cal. Mar 30; Sprague, ed. Aug 3, discuss. (full) Nov 9; undergr. vs. overhead wires, N. Y., Wheeler, Nov 2 *El Rev* * Sep 15, (full) *El Wld* 8 -**88**; traction probs., Bell (full) *El Rev Lond* July 12; applic. of electricity to, Sartiaux report, Nov 29-**89**

El Rev Lond st., Sprague, Mar 21, 28; traction data, Reckenzaun, May 9, 16; single and double trolley wire systems for.

Railroads, ELECTRIC

Mansfield, June 20; traction prog., Bell, July 11; overhead wires (mechan. strains), S. Russell, Oct 24, construct. * Nov 21; st., Bailey, Dec 26 *El Wld* Nov 22-**90**; traction, Reckenzaun, May 29, June 12, July 17; for rapid interurban commun., Zipernowsky, Sep 18, 25, Oct 2-**91**; traction, cost, Reckenzaun (full) * Mar 25; traction for tram cars, Epstein * July 15-**92**

El Rev elec. vs. horses, Oct 27-**88**; st., Griffin, May 11 *Sc Am Sup* June 15; series traction (undergr. conductor), Manville *El Rev* Oct 12; electric. for st. cars, Am. St. R. Assoc. com. report, 26-**89**; Waller-Manville traction system * June 14; Bailey, Nov 22-**90**; construct., Field (full) * Sep 19 sup; the dependent overhead, Mansfield and independent storage systems, Neftel, com. reports, Oct 31, 31, (full) *El Wld* 31, 31 *E News* 31-**91**

El Rev traction, compar. of mod. methods, May 28 *The Eng* Mar 25; relation of electric. to transport. June 25; discuss. (full) Nov 19, 26, traction, Dec 17, McTighe, 3-17; Pruynway elec. elevated * 24-**92**

El Wld Sprague, discuss. Oct 20-**88**; traction probs., Bell (full) * June 22; st., Am., table of, Oct 19; electric. as mo. power, com. report, 26; car service points, Crosby, Dec 21-**89**

El Wld single trolleys, City & Suburb. Telegr. Assoc., Taft decis. (full) Mar 1; Knoxville decis., Gibson's May 3; single and double trolley systems, Mansfield, 10; storage bats. and horses, compar. cost, Gadot, 10, 24, 31, June 7-21; the cur. as a traction increaser, Ries, June 7; traction prog., Bell, 28; lighting in R. service, Leonard (full) July 12; double trolley system imps. * 12; Harding's closed conduit * Oct 11; op. of, 18; earliest (hist.) * 18; mo. power, com. report, 25-**90**

El Wld construct., bonding the track, Colgate * Mar 14, line * 21, feed and trolley wires * 28; st. stats., Cen. bull. May 9; traction cost, West End, Boston, Sep 5; construct. and op. and cen. station interests, Field (full) 19; mo. power for st., com. report (full) 26; for rap. tran. between cities, Zipernowsky, Oct 10; Edison's view of future, 31, cors. Nov 7; cars speed in city sts., Hewitt * Dec 19-**91**

El Wld undergr. system, Bolling * Mar 19; track bonding and overhead construct., Wiley * Apr 2; transport. relations, Selden, June 25; legal decis. (full) July 19, litigation, Stone, Sep 3, 10; st. standards for, Crosby, Oct 29-**92**

Railroads, ELECTRIC

E Mag Sprague, May; undergr. vs. overhead wires, Webb, Aug; st., advantages, Prindle, Aug -**91**; st., as investments, Serrell, May -**92**; and cable, return of power in, Bryson *E & Min* * Dec 7-**89**

E News growth, Sep 7, Oct 6; cost and prog., T-H system * Nov 10; max. gradients on, Dec 1-**88**; Boston, Aug 10-**89**; cable, elec. and animal power, rel. econ., Cen. bull. report, May 23; st., mo. power for, Beckley, Sep 26-**91**

E News cost of traction, Sellon, Apr 16, imps., McIntire, Sept 29; conduit, Barkley * Oct 20; Intramural elevated elec., World's Col. exhib., inset * 20; and cable, compar. cost of op., report, 27 *E Rec* 29-**92**; st., table, Preece, Feb 11-**88**; development, Sprague, May 9; st., finances, Beckley, Sep 26-**91**

F Inst Griffin, Apr -**90**; applic. of electric. to, Sprague, abs. *Inst C E* v 100 -**90** *El Wld* v 15 -**90**; st., data, Sprague system, Hutchinson, abs. *Inst C E* v 101 -**90** *El Eng* -**90**; and cable, Kebby, abs. *Inst C E* v 105 -**91** *J Assoc E Socs* Feb -**91**; elec. locomotion, Geipel *Inst M E* Feb -**88**; in cities (extent) *R & Eng* Nov -**90** *El Eng;* elec. light in R. service, Markland *R Gas* Feb 27-**91**; future, Sprague, abs. July 8 -**92**

Sc Am Sup traction and accums. * Apr 13-**89**; Nov 15-**90**; conduit, Field * Mar 14; notes, Pope, Apr 4; high speed work, Crosby (full) * 18; development, Griffin, Oct 10-**91**; trolley system discuss. June 4; overhead system * Dec 24-**92** *St R J*

St R J storage and direct systems, Blackwell cor. Apr; traction, Sprague cor. June, munic. rap. tran. prob. do. Aug; list Nov -**88**; Bentley-Knight * Feb; Mansfield, Sep; mo. power finan. conditions of success, Barr report, Nov -**89**; trams cable, horse and other, Fairchild (very full) * Mar - July * Sep * Oct * Dec -**90** * Jan - Apr * June -**91**; mo. power, com. report, M'Carty, Nov, Nov -**90**

St R J Thos. Davenport's model invention, Pope * Apr; and cable construct. and op., Kebby (full) May; Condict. July; overhead wire, instructions to linemen, Baker * Aug; mo. power for st., com. report, sup. Sep 15, Oct; from sociological point of view, Crosby, Nov; nomenclature of terms used, Nov; practical side of, Bickford * Nov, Dec -**91**

St R J overhead construct., Bickford, Feb * Mar, C. Smith report, Nov; and cable, rel. advantages, Feb, cor. Mar, July,

Railroads, ELECTRIC
Aug; standards, Crosby report, Nov -**92**; Griffin (full) *Soc Arts Mass* -**89**
The Eng in U. S., list, Feb 15; Northfleet series, inset * Mar 15-**89**; troubles in Am., Sprague, Mar 13-**91**; traction and finan. aspect, Sellon, Mar 25, cost and load diags., Reckenzaun, Apr 1, Jarman system * June 10-**92**. See also STREET R's
ALBANY *St R J* * June -**90**
ALLEGHENY City, Pa., Bentley-Knight *El Wld* * Feb 18-**88**
ASBURY Park, N. J., Daft, power test, Idell *El Wld* June 8-**89**
BENTLEY-Knight imps. *El Rev* * May 4-**89**; (conduit) *St R J* * Mar -**88**; * Feb -**89**
BESSBROOK & Newry, Hopkinson, discuss., inset (very full) *Inst C E* * v 91 -**88**
BIRMINGHAM, England *St R J* Dec -**91**
BOSTON, Mass., West End st. n *El Rev* * Aug 27-**92**; power station *Pwr* * Apr, n *El Wld* * Jan 18-**90**; traction cost, Sep 5-**91**; report, Aug 20, Nov 19-**92**; *E News* Aug 10-**89**; rail section * Oct 25-**90**; Whitney, abs. *Inst C E* v 99 -**90** *El Eng;* power plant *St R J* Dec -**89** * Jan -**90**; * May; report, Dec -**91**; Sprague system * Jan -**89**. See also ST. R's, Boston
BRAIN system of traction *El Rev Lond* * Sep 9 *Eng* * Sep 9, closed undergr. conduit, n *E & Min* * Sep 24 *St R J* * Dec-**92**
BRAKES, Widdifield & Bowman *El Wld* * May 18-**89**; Genett's elec. air *St R J* * Aug -**92**
BROOKLYN trolley system dangers, Moses *El Rev* * Sep 10-**92**
BUDAPEST, Hering *El Wld* * Oct 24-**91**; undergr. conduit, May 14; Bartol, n *F Inst* * Feb -**92**; Uppenborn *Sc Am Sup* * July 4; Gribble *St R J* * July -**91**
BUFFALO (plant) Field *St R J* * Feb -**91**
BURGENSTOCK, first mt., Lucerne, Switz. n *The Eng* Sep 7-**88**
CARS, elec. cur. as a traction increaser, Ries *El Eng* June 4; Edison's gear * Sep 17; Westinghouse * Oct 15; Baldwin's reversing gear * Oct 22; Belding's gear * Nov 26-**90**; T-H single reduction, * Feb 4-**91**; hist. review *El Rev* sup. * Oct 18-**90**; Bentley-Knight truck, standard motor *El Wld* * Jan 12 * May 4-**89**; running gear * Oct 18-**90**; Pullman st. double deck *E News* * Oct 31-**91**; Wenstrom hydr. gear *The Eng* * Dec 5-**90** *El Eng.* See also R's, elec., brakes — fenders — heaters

Railroads, ELECTRIC, CHICAGO - St. Louis high speed, proposed *El Wld* * Feb 20, Adams * June 11-**92**
CINCINNATI, Sprague system *Eng* * Aug 8-**90**
CONDUITS, Harding's closed *El Wld* * Oct 11-**90**; Barkley *E News* * Oct 20-**92**; Field *Sc Am Sup* * Mar 14-**91** *El Eng.* See also R's elec., Bentley — Brain's — Budapest — Love — Siemens, etc.
DAFT, work on elevated roads and rap. tran. *El Eng* Aug *El Rev Lond* * Aug 2, 9; test, Idell *Sc Am Sup* June 22-**89** *Steven's Indic*
DUBUQUE, Ia. Edco storage bat. motor, De Land *El Wld* * July 25-**91**
EDCO storage bat. st. car, Bates *El Eng* Oct 22 *El Rev* 25 *El Wld* 25 *St R J* Nov -**90.** See also R's elec., Dubuque
EDISON'S st. *El Eng* Nov 18-**91**
EICKEMEYER-Field motor *El Eng* * Dec 9-**91**
FENDERS, West End, Boston, report *E News* Feb 21-**91** * Oct 27-**92**
FLORENCE & Fiesole, Sherbner (full) *El Rev Lond* * Sep 25, inset *Inst C E* * v 106 -**91**
FRANKFURT-Offenbach tramway, Krause *El Eng* * June -**88**
GEARING, epicylic, for cars and elevators, Aldrich *El Eng* * June 22-**92**; wooden-toothed *El Wld* * Aug 2-**90.** See also R's., elec., cars — motors
GREAT Britain, tramways position in England *El Rev* Aug 8 *E News* July 18-**91**; United Kingdom, table *El Wld* Jan 25-**90**; and cable, McCallum *St R J* Oct -**92**
HEATERS, the Carpenter-Nevins *El Eng* * Dec 3; elec., Hanna *El Rev* * Dec 6-**90**
HAMBURG, Huber, inset *Inst C E* * v 92 -**88**
IRISH'S system *The Eng* Apr 6-**88**
LINEFF tramway system *El Eng* * Oct 29, Kapp report *El Rev Lond* * July 4, 25, Sep 19 *El Wld* * Oct 4; undergr. system *St R J* * Nov; magnetic *The Eng* * Aug 15-**90**
LIVERPOOL elevated *Eng, The Eng* * Aug 15-**90**
LONDON, City & So. Lond. subway *El Rev Lond* * Nov 7-**90,** Grindle, July 29, Aug 12, Sep 16-**92** *El Wld* * Nov 29-**90** *R & Eng* * Jan -**91**
LOVE conduit system *R Gaz* * Sep 9-**92**
LOWELL, Mass. plant *Pwr* * Dec -**91**

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MOTORS, st., Manhattan elevated and st. locom., compar. tests, Moss, discuss., insets *Am C E* * v 23 -**90**; total effic. and power required to drive car, Bonnett, v 27 -**92**; Eickemeyer-Field *El Eng* * Dec 9; formulas, Reid, 23-**91**; elec. control of, methods, Parshall * Apr 27 *El Rev* * 30, discuss. (full) May 14 *El Wld* * Apr 30 * May 14 *St R J* May; tests at Minneap., Shepardson (full) * July 9 *El Rev* * 16, (full) *El Eng* 13; st. car, testing, Hutchinson * Aug 31; Rae, equip. * Nov 30; Sprague, test *El Rev Lond* 11-**92**

El Rev Sprague, magnetic data, Parshall * May 31 *El Wld* * 31; the Wenstrom * Sep 27-**90**; the Palmer * Nov 28-**91**; Bentley-Knight standard *El Wld* * Jan 12 * May 4; Sprague st. Dec 14-**89**; in R. work, Bell *R Gaz* Mar 21-**90**, eds. Apr 17, 24-**91**, (full) *El Wld* Mar 22; wooden-toothed gearing * Aug 2-**90**; Short's gearless, Higgins (full) *St R J* * June -**91** * May *El Wld* op. (full) * Apr 16; bucking of st. motors, Shepardson * Sep 10-**92**; new departure in construct., Leonard *E News* Nov 28-**91**; Sears, ed. comments *R Gaz* Nov 18-**92**

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NEVERSINK mt., test, Hering, Aldrich (very full) *El Wld* * May 28 - July 30-**92**

NEW York, Fulton st., Bentley-Knight (undergr. wire) *E Rec* * Apr 6, n *The Eng* * Feb 1-**89**

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BOSTON, West End, Shaw (full) *El Eng* * Oct 21-**91**, n *El Wld* * Jan 18 *E Rec* * Apr -**90** *St R J* * Dec -**89** * Jan -**90** * Sep -**92**
BROOKLYN City *St R J* * Oct -**92**; Buffalo, Field *El Eng* * Jan 28-**91**; Chic. City *St R J* * Dec; Columbus, O. * June -**92**; Indianap. *El Rev* * July 5-**90**
KNOXVILLE, Tenn. *El Eng* * Aug 6 *El Rev* * 9 *Pwr* * Aug -**90**; Lake Roland eleva. R., Balt., Abbott *El Eng* * Dec 7-**92**; Little Rock, Ark. (full) *El Rev* * Aug 20 *St R J* * Sep -**92**
LOWELL, Mass., Shaw *El Eng* * Jan 14-**91**; Lowell & Suburban, do. * Oct 12-**92**; plant *Pwr* * Dec -**91**; Newark, N. J. * Jan -**92**; Pitts., Duquesne traction Co. *St R J* May -**91**; Topeka, Kan. rap. tran. *El Rev* * May 25 *El Wld* * 25-**89**; Utica, N. Y., test, Heilman, June 6-**91**
RAE system *El Eng* * Oct 15-**90**
RICHMOND Union, inset (full) *St R J* * June -**88**
RIVER & Rail storage car system *El Eng* * Aug 6 *El Wld* * July 26-**90**
ST. Paul, Minneapolis, *St R J* * Sep -**91**
SERIES Elec. Traction *El Rev Lond* * Mar 15-**89**
SHORT series system *St R J* * May -**88**, sup. * Oct -**92**
SIEMENS & Halske's conduit *St R J* * Dec -**92**
SISSACH-Gelterkinden, the (full) *El Wld* * Nov 7-**91**
SNOW sweeper, Thomson-Houston *El Rev* * Jan 9-**92**
SPRAGUE system *El Eng* * Sep -**89**; vs. T. H. system, Hutchinson *El Wld* Nov 1-**90**; Boston *St R J* * Jan -**89**
SOUTH Staffordshire tramways *El Rev Lond* * Nov 18 *The Eng* * 18-**92**
STORAGE bats., Direct Elec. Co's system *El Eng* * May 13; in traction work, Pumpelly, July 9-**90**; Phil., Lehigh ave. * Mar 25-**91**; in R. work, Macrae, June 29-**92**; traction, Bracken *El Rev* Aug 24 *St R J* Sep *El Wld* 17; Bell, Oct 5-**89**
El Wld (accums.) vs. direct cur. for traction, Hunter, May 12; Julien reg. switch * July 21-**88**; and horses, compar. cost, Gadot, May 10, 24, 31, July 7-21; Chamberlain's rack * Aug 9 -**90**; (accum.) traction, Paris, n Apr 9-**92**
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abs. *Inst C E* v 106 -**91** *El Wld* v 18 -**91**; applic., Hewins * *Soc Arts Mass* -**90**
St R J Sprague system, Boston * Jan -**89**; Fairchild * May; Main's system * July -**90**; mo. power, storage or primary, independent system, Neftel, Nov -**91**; cals. for, Huber, n *The Eng* May 4-**88** *El Eng.* See also R's, elec., Edco — River & Rail, etc.; STORAGE bats.
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WENSTROM system *El Wld* * Oct 25-**90**
WYNNE'S urban system, report *El Wld* * Mar 29 *E News* Apr 5-**90**
ZIPERNOWSKI vertical rail tramway *El Rev Lond* * Nov 15 *El Wld* * Dec 7-**89**
ELEVATED, elec. work on and rap. tran., Daft *El Eng* Aug *El Rev Lond* * Aug 2, 9-**89**; Pruynway elec. *El Rev* * Dec 24-**92**; Riley elec. system *El Wld* * Mar 16-**89**; Day system *E News* * Dec 12; elec. mo. power on, W. N. Smith (full) *Sc Am Sup* * Feb 21, 28 * Mar 14; and incline plane, Fairchild *St R J* * Feb * Mar -**91**; Rap. Tran. Commiss. report to Mass. Legislature, Apr 5-**92**. See also CABLE R., Los Angeles single-post viaduct; R's, incline — mt.
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ERIE. See R's, N. Y., Lake Erie
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TIES. See CROSSTIES
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TRESTLES. See TRESTLES

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Railroads, UNITED States
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YUCATAN, E. Thompson report *E News* Dec 15-**88**
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Rails

R. Hunt * v 17 -**89** *E & Min* * Oct 27, Nov 3 *E News* * Dec 1-**88**; wear of as related to their section, Dudley *Am Min* * v 18 -**90**

Eng use of heavier, Sandberg, Feb 8-**89**, steel, do. Aug 1, 1 * 8; rail profile tracing ap., Schilling * Sep 19 *R Gas* * Oct 10-**90**; devel. Am. rail. and track, Watkins *Eng* * July 1, 22 * Aug 12 * Sep 23 * Oct 14, 21-**92**

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Rails

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Rail SECTIONS
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BOSTON & Albany *E News* * Apr 4-**91**
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GREAT Northern, U. S. *E News* * Feb 13-**92**
KENTUCKY Union R. *E News* * Mar 16-**89**
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VIGNOLES, the first *E News* * Nov -**89**

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Rams and hammers, Jameson *R & Eng* Oct -**89**. See also HYDR. rams; STEAM hammers

Rapid transit, Rap. Tran. Commiss. report to Mass. Legislature, Apr 5, '92, abs. *St R J* May -**92**; elec. interurban commun., Zipernowsky *El Rev Lond* Sep 18, 25, Oct 2-**91**; and elec. work on N. Y. eleva. R., Daft (full) *El Wld* July 6 *El Rev* * 6-**89**; N. Y., Sprague, Mar 7, Lond., Sterne, discuss. * 21; system, Sprague, June 6-**91**, N. Y., solution do. (full) *El Wld* sup. Feb 21, Mar 7, (full) May 30-**91**; in great cities, Day, Jan 2-**92**; prob., Gribble (full) *E Mag* * May * June; in N. Y. July -**91**; lessons in, Heilprin, July -**92**; N. Y. city *E & Min* * Mar 23-**89**, Rap. Tran. Com. report * Oct 24-**91**

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R Gas N. Y., T. Cooper, Mar 20, Gribble, Apr 3, W. H. White * 24; reports, ed. (full) Oct 9 * 16, 23, 23, Nov 20-**91**; speed, Cowper, July 29-**92**; Thompson's gravity system *Sci Am* Sep 8-**88**; Chic., Stoltenberg *Sc Am Sup* * May 25-**89**; in cities, T. C. Clarke *Scribner's* * June -**92**; Haupt *St R J* Feb -**88**; Sprague, sup. * Mar, June, question, Gribble * Mar, May, Crosby * Apr; Lond., Reckenzaun, May, Aug * Dec -**91**. See also names of places; R's, elec. — elevated — underground, etc.

Ravine du Sud, Is. of Hayti, Crowell, discuss., insets *Am C E* * v 24 -**91**

Rawlinson, Robert *The Eng* Jan 6-**88**
Raymond, Robert R., por (full) *E & Min* * Dec 29-**88**
Real estate, Internat. Co. of Mex. & Lower Cal., n *E News* Mar 31-**88.** See also LAND
Reed, Edward M. *Am C E* v 26 -**92** *Am M E* v 13 -**92**
Reed, Samuel B. *Am C E* v 27 -**92**
Refractory materials, Egleston *Sc Am Sup* Sep 27, Oct 4-**90.** See also BRICK, fire-brick
Refrigerating, aut. system, Denver, Col., Hanks, insets *Am C E* * v 24 -**91**; 35-ton machine, ammonia-absorption type, performance, Denton *Am M E* * v 10-**89,** 75-ton do. * v 12 -**91** *E & Min* * May 16, 23-**91**; plant test, De V. Wood *Am M E* * v 11 -**90** *E News* * June 28-**90**; results of performance of, Denton-Jacobus, July 7 *Am M E* * v 13 -**92**
Cassier's mechan. refrigeration, Penney, * Dec -**91**; La Vergne Co. * Apr -**92**; Bate Co. decis. *El Wld* Feb 2-**89**; de la Vergne system, inset *Eng* * June 15, 22-**88**; ammonia compression system * Feb 8-**89**; machines, Richard, bk. review, Jan 9; tests * July 31 * Aug 28; and ice-making plant, Newcastle-on-Tyne * Dec 4-**91**
E News Miller's ap. * Jan 9; use of oil in ammonia gas compressors and effic., Strombeck, insets *F Inst* * Apr -**92**; use of ammonia as refrig. agent, Lightfoot *Sc Am Sup* May 26 *The Eng* Oct 26-**88**; machines, Peabody *Tech Q* * May -**89**; machine, Birkenhead *The Eng* Oct 5-**88**; Arktos cold air and freezing ap. * Mar 8; Pontifex's machine, Sep 27-**89**; Linde system plant, 150-ton, Shadwell works, inset * May 16, 30-**90.** See also ICE machines
Refuse, disposal, house *Eng* May 15-**91**; Watson (full) Sep 16 * 30, and ed. *E News* Oct 6, N. Y. city report, 27 * Dec 1; cremators *E Rec* * Oct 8-22, Nov 19-**92.** See also CREMATORIES; MUNIC. eng.
Reid, David *Inst C E* v 110 -**92**
Rendering tanks construct. *Locom* Feb -**89**
Rennie, William C. *Inst C E* v 105 -**91**
Reproduction, probs. of, Hartog *Contemp Rev* July -**92**
Reservoirs, storage, appropriation, ed. *E News* Oct 6-**88**; waste weir capac. det., McAlpine, June 29-**89**; U. S. and Can., embankments and dams, inset * June 21-**90**; covered, Swan *R & Eng* Oct *J N E Water W Assoc*, *E Rec* Oct 13, 20 -**88**

Reservoirs

E Rec distrib., Curtis, June 20; water storage, Stearns, Oct 17; det. of capac., Fitz Gerald, 24; storage, Mass. State Bd. of Health report, Nov 14-**91**; use of asphaltum for linings, Schuyler, Dec 17-**92** *Am C E;* res. dams, safety and service of, Kresnik, abs. *Inst C E* v 99 -**90** **Woch Ost Ing* -**89.** See also DAMS; WATER-works, under names of places

BOSTON, Mass., Waban Hill *E Rec* * Aug 24, 31-**89**

BUFFALO, N. Y., Prospect, new *E News* * Jan 10-**91**

COSHOCTON, O. 320,000 gal. covered *E Rec* * Aug 15-**91**

EALING, Grand Junct. Co. storage *The Eng* Aug 24, 24-**88**

EGYPT, the Raiyan impounding, Nile flood, Whitehouse *Eng* * Sep 14-**88,** Sep 19-**90**; storage in, ed. Oct 16-**91**

HALLINGTON, West, Henzell, inset *Inst C E* * v 102 -**90**

HUDSON, Wis. covered *E News* * Mar 15-**90**

MANCHESTER works, inset *Eng* Feb 5-**92**

NASHVILLE, Tenn., Parsons *E News* * June 16-**88**

NEBRASKA City, Neb., failure of *E News* * Apr 19-**90**

NEWTON, Mass. covered *E Rec* * Apr 18-**91**

NEW York, reservoir 'M,' inset *E News* * Mar 22-**90**

PARIS, France, Montmartre 3-story covered *E Rec* * Aug 9, abs. *Inst C E* v 100 -**90** *Sc Am Sup* * Mar 8 *The Eng* * Jan 17-**90**; Bechmann, abs. *Inst C E* v 105 -**91** *An Ponts* Feb -**91**

PHILA., Conshohocken hill remark. breaks, Lukins *E News* Aug 18-**88**

TORCY, France *R & Eng* * Jan -**90**

TORONTO, Ont., Can., Rose hill embank. *E News* * Aug 2-**90**

WHEELING, Va. *E News* * Mar 12-**92**

Resins, waxes and solid paraffins, Church (full) *Sc Am Sup* * Apr 9-**92**

Retaining walls, for earthwork, Greene *E News* * Dec 29-**88**; design of, K. Allen *E Rec* * Nov 12, 19; old revetment wall, Montreal har., Sproule *R & Eng* * Dec *R Gaz* * Nov 18-**92**; M'Elroy, Nov 9-**88.** See also DAMS; HARBOR eng; R's, embank; RESERVOIRS

Retort, mechan., with continuous feed and discharge, Haig *E & Min* * Jan 31-**91** *J Soc Chem Ind.* See also GAS retorts

Reynolds, Edwin, por. *Cassier's* * Mar -**92**

Rhind, James *Inst C E* v 99 -**90**

Rice, culture in cen. China, Franklin *Sc Am Sup* June 8-**89**; hist., Proctor, Oct 10-**91,** manuf., do. July 9-**92**

Richards, Thomas M., por. *E & Min* * Nov 29-**90**
Richardson, Robert *Inst C E* v 107 -**92**
Richardson, William A. *Locom* Apr -**89**
Richmond, Va., eng. prob. at (canal, etc.) Adams *Am M E* * v 12 -**91** *Eng* Jan 9-**91**
Riddell, Robert (full) *Inst C E* v 106 -**91**
Rigden, John L. *Inst C E* v 109 -**92**
Ring, Robert *Inst C E* v 100 -**90**
Rings, thin elastic, flexure of, De V. Wood *Am M E* * v 12-**91**
Riotte, Eugene N., por. *E & Min* * May 16-**91**
River-gauging at Vyrnwy reservoir, Parker, inset *Inst C E* * v 92 -**88**
River motor, fluviatile *Sc Am Sup* * July 28-**88**
River profile of bottom register ap., Stecher *E News* * July 25, n *R & Eng* * Oct -**91**
Rivers, improvement, Atlan. coast, Craighill, *E Rec* * Aug 11-25, discuss., insets *Am C E* * v 19 -**88,** sedimentary discuss., Striedlinger, Worthen, Henshaw, insets * v 20 -**89**; mean horse power of, cals. variable stream and cost of replacing power lost by partial diversion of the flow, Grant, discuss. v 22 -**90**; self-purification of streams, Rafter, insets * v 24 -**91**

Am M E river practice of the west (boats), Sweeney * v 9 **88**; stream measurements, U. S. Geol. survey results, Newell (full) *Am Min* * v 20 -**92**; signalling across, in India, Melhuish *El Rev Lond* Apr 18-**90**; future world's highway, Gribble *E Mag* * Apr – June; flood effects in western, Going, Sep -**92**; mining in Cal., Boynton *E & Min* * Sep 5-**91**

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Inst C E simple method of ascertaining discharge, Harlacher, Richter, abs. * v 91 -**88**; bars at mouths of tidal estuaries, Wheeler *The Eng* Feb 7, discuss., inset (very full) *Inst C E* * v 100 -**90**; self-purification, Stearns, abs. v 105 -**91,** Meyer, abs. v 109 -**92** *Mass State Bd. of Health;* crossings and bridge piers, Otagawa *R & Eng* * Nov * Dec -**88**; nav. river material, expt. researches ap. *Sc Am Sup* * Sep 24-**92**

Rivers

The Eng river flushing, Milwaukee, Dec 28-**88**; imp., applic. of transporting power of water to deepening, Wheeler, Oct 25, Nov 8-**89**, July 18-**90**; and navigable canals, England, Dec 25-**91**; tidal, buoying and lighting, Wheeler * Apr 8, 29-**92**. See also CANALS, rivers in France, Belgium and Germany

AIRE & Calder nav. and canal waterway, Bartholomew *E News* * Aug 30-**90**

AVON imp. below Bristol, Chatham, insets *Inst C E* * v 98 -**89**

BAVARIA, imp. *E News* * Mar 17-**88**

BILBAO imp. *E News* * Aug 31-**89**, Churruca report, abs. *Inst C E* v 76, 98, 104, insets, 107 -**92**

BRAZOS, Tex., imp., jetties *E News* * May 18, June 22-**89**

BRENTA imp., Cesareni, abs. *Inst C E* v 99 -**90**

CLYDE, Millar, Blackie, Lond. '88, bk; export trade '88 *Eng* Jan 4; Macalister, abs. *Inst C E* v 95 -**89**

COLORADO cañons, availabil. for R. purposes, Stanton, discuss., insets (full) *Am C E* * v 26 -**92**

COLUMBIA, jetty *E News* * Apr 18-**91**

COSEL, imp. at, Oder river (Europe) *E News* * May 3-**90**

DANUBE imp. *E News* July 11-**91** * Apr 2-**92**; the Sulina mouth of, Kuhl, Hartley append., insets, *Inst C E* * v 91 -**88**, inset * v 106 -**91**

DELAWARE, obstructions in *Sci Am* Mar 16-**89**

ELBE, ht. prediction of, in Bohemia and Saxony, Harlacher, Richter, abs. *Inst C E* v 91; regulation between Melink and Koniggratz, Oelwein, abs. v 92 -**88**; Sax., flow measurements, 1886-7, Ringel, abs. v 95 -**89**

JAMES, imp. at Richmond, Va., W. Adams *E News* Nov 22 -**90**

LOIRE, imps., Paris exhib., map *Eng* * July 19, 26-**89**

MAIN, canalization between Frankfort and Mainz, abs. *Inst C E* v 92 -**88** *Deut Bauz* -**87**

MISSISSIPPI imp., flood hts. in reach between Helena and Vicksburg, Starling, insets *Am C E* * v 20 -**89**, keeping within banks, do. *E Mag* * Apr -**91**; impending disaster on, June, prob., Dutton, Aug, Starling * Nov -**92**

E News connecting with upper lakes, Handburg, Feb 18-**88**; Gov't. protective works, mat, Memphis * Oct 26; levee con-

Rivers, MISSISSIPPI
struct. Nov 9; bank protection * Oct 26, Dec 14-**89**; flood of 1890, Harrod, Apr 5; Lower, protection from overflow, J. B. Johnson, 19-**90**; Sabine Pass imp., Turtle cor., Haupt *F Inst* Aug -**88**; hist., Redway (full) *Sc Am Sup* July 11, 18-**91**
ODER, imp. at Cosel (Europe) *E News* * May 3-**90**
PORTLAND, W. T., imp., Freeman, inset *E Mag* * Aug -**92**
POTOMAC basin, hydrography of, Babb, discuss., inset *Am C E* * v 27 -**92**
RHINE reg. works, between Eltville and Oestrich, Imroth, abs. *Inst C E* v 92 -**88**; reg. at St. Gall, Wey, abs. v 103 -**91**
RHONE, imp. of months of, Guerard, report abs. *Inst C E* * v 101 -**90**. See also POWER, Rhone river at Geneva
SEINE, lower, Suresnes locks and weir, Luneau, abs. *Inst C E* v 101 -**90** *An Ponts* * v 18 -**89**; canalization of, abs. *Sc Am Sup* * Mar 16-**89** *Genie Civil*
STEEPING and Wainfleet Haven imp. *The Eng* * May 13-**92**
SUSQUEHANNA floods, Raymond report *E Rec* Jan 23-**92**
WEAVER nav., Sauer *E News* Aug 30-**90**; Stoney's sluices, Manchester ship canal *The Eng* * Jan 9-**91**
WITHAM channel and outfall imp. works, Williams, discuss., inset *Inst C E* * v 95 -**89** *The Eng* Dec 7-**88**
YELLOW *E News* Mar 31-**88**
Rivet signs, uniform system of *E News* Jan 25, cor. Feb 9, symbols, cor. * Mar 2, Seaman, cor. * Apr 13-**89**; diag. * Sep 15 -**92**
Riveted joints, on an angle, expts., Flint *Am C E* * Oct 27-**92**; copper, strength *Eng* * Apr 24; * Dec 4-**91**; riveting tests, Buckholz * Dec 6-**90**; diags. * Feb 6-**92**; net section in, Cooper *R Gaz* * Aug 22; plates, tests * Oct 10-**90**; Allen (full) *Sc Am Sup* * July 18-**91**; of max. strength, Nicolson *The Eng* Oct 19, Nov 9, 30-**88**. See also BOILERS, riveted joints
Riveter, Allen pneu. *Eng* * Nov 23-**88**; Schonbach's hydr. * May; hydr., 200-ton plant * Feb 14, 14-**90**
Road engines, rollers *Cassier's* * Aug -**92**; locom., Burrell *Eng* * June 20; steam on common roads, McLaren, Nov 21 *The Eng* Nov 21 *E News* Dec 20; locom., Aveling & Porter * June 28-**90**; traction, European experience, McLaren * Apr 4; the Springfield steam roller, inset * Nov 21-**91**; Burrell compound *The Eng* * Dec 12-**90**; 8 h. p. compound * Sep 11 -**91**

Roads, betterment of our highways, Shaler *Atlan M* Oct; and road rollers *Cassier's* * Aug; our common roads, Potter *Century* * Apr -**92**; highways and nat. prosperity, North *E Mag* * Apr; good wagon roads, importance, Haupt, June; Europe and Am., Potter * Aug; wagon, future, Claypoole, Oct -**91**; convict labor in road making, Roberts, July -**92**; *E & Min* Apr 16, Mundin, Baker, 23-**92**; and pavements, Love, bk. n July 12-**90** *E Rec*

E News valuation of road metal and setts for paving, Stock, Sep 22 *The Eng* Aug 31-**88**; country, in France, construct. and maintenance laws *E News* Feb 6, 23, Mar 2; country, legislation in Pa. Apr 6; construct. and repair of, London, Strachan, 13; good, value of, May 18; common, N. Jersey law, July 27; Am. legislation, bk. n Dec 7-**89**

E News country, notes, Downing, Feb 8; foreign highway construct. and maintenance, 22, Mar 1, 15, 29; maintenance, Roads Imp. Assoc., Lond. * Aug 16; repair and maintenance of, England, Sep 13; road work in Richmond Cty., N. Y. Dec 13-**90**; country, money value of good, report, Feb 7-**91**

E Rec road making, Herschel (prize treatise) Mar 9, Apr 20, 27, May 4, 11; Greene, Aug 10 *Harper's W* Aug 10, 17; good, Pope *E Rec* 31, Shaler, abs. Nov 9 *Scribner's;* Bridgeport macadam, North *E Rec* Dec 28-**89**

E Rec resist. to traction, Hering, Jan 25; Penn. highways report, Feb 15; construct. and maintenance, Thompson (prize article) Mar 29, Apr 5-19, Pritchard, 19, 26, May 3, com. comments, 10; main, maintenance, Hooley, Aug 10; machinery, cost of, Oct 4-**90**; European sts. and highways, Dec 12; Brookline, Mass. macadam, contract, 19-**91**

E Rec county, construct. and repair, Owen, Jan 30 *Sc Am Sup* Mar 12 *E News* Feb 13; road across a marsh, Waite cor. *E Rec* Feb 20; highway roller repairs, French system, Durand-Claye, Mar 5, Bacot, cor. 19; road making in eastern Mass., McClintock, 26; administration of French highways, Neff, Apr 16; Telford road making, Lenox, Mass. * 30; instruction in highway eng., C. Allen, June 11, July 2, 23, (full) *Soc Arts Mass* -**91**; highway construct., disputed points, Owen, Nov 19 -**92** *Am C E*

Inst C E roadways construct. across peat bogs, Schacht, abs. v 104 -**91**; highway, location, ed. *R & Eng* * May -**90**; sections, Prov., R. I. * July; Janvier *Sc Am Sup* Feb 27; legal

Roads
responsibility for defective highways, Bly *St R J* Mar -**89**; Brighton foreshore imp. *The Eng* July 12-**89**. See also MUNIC. eng; PAVEMENTS; STREETS
Road vehicles, draught and haulage of *Sc Am Sup* * Dec 5 *The Eng* * Oct 16, cor. Dec 4 * 11, 25-**91**
Roanoke, Va., survey of *E News* * Jan 9 * June 23-**92**
Roberts, Peter *Inst C E* v 96 -**89**
Robertson, Henry *Inst C E* v 93 -**88**
Robertson, James (full) *Inst C E* v 99 -**90**
Robinson, Moncure (full) *Am C E* v 26 -**92**, n *R Gas* Nov 13-**91**
Robinson, S. S., por. *E & Min* * Apr 11-**91**
Rock, drilliing machine, hydr. *Eng* * Feb 17-**88**; Dubois' boring machine, Paris exhib. July 12-**89**; M'Culloch's drill, Rio Tinto * Sep 12-**90**; drills, Carbutt & Davey, Mar 27; and ore breaker, Gates I. Co., Chic. * June 19-**91**; and ore crusher, Brennan *E News* * Oct 18-**90**; removal under water without explosives, Lobnitz, inset *Inst C E* * v 97 -**89**. See also DISINTEGRATOR; DRILLS; MILLS; QUARRIES; STONE and names of rocks
Roe, John P. *Inst C E* v 98 -**89**
Roehricht, Richard H. O. *Inst C E* v 106 -**91**
Rogers, William *Inst C E* v 95 -**89**
Rolling mill engines, reversing, Krupp works, Essen, Ger., inset *Eng* * Sep 5-**90**; details * Dec 4-**91**; 10,000 h. p., Jarrow *The Eng* * Aug 9-**89**
Rolling mills, Simond's universal *Eng* * May 25 *Sc Am Sup* * May 5-**88** *Iron Age;* 15 in. 3- high blooming, Lack. I. & C. Co., Scranton, Pa., inset *Eng* * Jan 23; rolling fluid metal, H. Bessemer * Oct 9-**91**; failures of chilled iron rolls, Winder * Oct 21-**92** *E & Min* construct. of passes in rolls for reducing metals, Hewitt, Aug 25 * Sep 1-**88**; Am., evolution of, R. Hunt *E News* Nov 28, 28, (full) *R Gas* Nov 20-**91** *Am M E;* universal, for girders and cruciform sections, Sack *Sc Am Sup* * Jan 7-**88** *The Eng* * May 10, 17-**89**. See also STEEL, German works
Rome, excavs. in ancient, Lubbock *Sc Am Sup* Mar 22-**90**; devel. of capital at, Hemphill, Oct 1-**92**
Roofing, slates, strength and weathering qualities, Merriman, discuss., insets *Am C E* * v 27 -**92** *E & Min* Sep 24-**92**; paper for material *E News* Sep 21-**89**; roll tar paper manuf. (full) *Sc Am Sup* Sep 26-**91**; tiles glazing, terra cotta, etc. July 9-**92**

Roofs, det. of stresses in elastic systems by method of least work, Cain, inset (full) *Am C E* * v 24 -**91**; Cathcart st. station, Greenock R., inset *Eng* * Mar 22-**89**; Fairfield works boiler shop, Govan * Oct 3-**90**; July-Sep -**92**

E News 22d reg't. armory drill room, N. Y. * Apr 13-**89**; truss failure, Troy, Ala., cor. * May 9-**91**; trusses, coeffs. for figuring strains in, table * Aug 11; 4-mile crib, Chic. * Sep 15 -**92**

E Rec 12th reg't. armory, N. Y., inset * Jan 7; truss, So. Brooklyn R. car shed * Mar 17; a cantilever * Aug 4; St. Paul church * Oct 27; rink truss * Nov 17-**88**; So. armory drill-hall * Apr 20; armory, Cin., O. * Dec 7-**89**

E Rec iron mill * Jan 25 * Feb 1-**90**; arcade, Cleveland * Mar 21, 28 * Apr 4; erection traveler, Newport News Ship Bld. Co. * Apr 25; Charleroi plate glass works * May 9; iron shop * Aug 29; strains in trusses *Locom* * May -**91**

R Gaz Westinghouse machine shop * June 6; rational trusses Arajol, June 27, cor. *The Eng* * Oct 24-**90**; roof water removal, Porter *Sc Am Sup* * May 18-**89**; iron *St R J* * Aug -**90**; iron, So. Mahratta R. *The Eng* Oct 19-**88**; barracks at Aden, Aug 30, Sep 6-**89**; a rational truss, Graham * May 16-**90**. See also BUILDINGS; EXHIBS., U. S. Columbian – U. S. Gov't. bld; FACTORIES; MILLS; Rs, stations, etc.

AGRIC. bld., Chic. exhib. *Eng* * Apr 29 * May 6-**92**

ALLEGHENY County court-house *E Rec* * Nov 10-**88**

CARLISLE Corp. markets *The Eng* Mar 30, Apr 13, 13-**88**

CHICAGO Auditorium trusses *E Rec* * Nov 22, 29-**90**

DULUTH Union depot *E Rec* * Feb 6 * Mar 12, 19, 26 * Apr 9, 23, 30 * May 21-**92**

DUNDEE R. station, Caled. R., inset *Eng* * June 28-**89**

EDINBURGH exhib, inset *Eng* * Apr 11-**90**

FOUNDRY plant, the Worthington, Elizabethport, N. J. *E Rec* * Apr 2-**92**

HORTICULTURAL bld., Columb. exhib. *Eng* * Nov 11, 18, 25-**92**

MACHINERY Hall, Columb. exhib. *E Rec* * Dec 24, 31-**92**

MADISON Sq. Garden bld. *E Rec* * Jan 17-31-**91**

MANUF'S bld., Columb. exhib., insets *E News* * July 28 * Sep 1, 8-**92**

OLYMPIA, Nat. Agric. Hall, erection, Read *Eng* * Dec 28-**88**

PARIS exhib., Machin. hall, inset *Eng* * June 1-**88**; blds. * May 3-**89**

Roofs, PENN. R., Jersey C. terminal station *Eng** Apr 1-**92,** train shed, inset *R Gaz* * Oct 2-**91**

TRANSPORT. bld., Columb. exhib. *Eng* * Dec 2, 9, inset *E News* * 29-**92**

U. S. Columb. exhib. blds. *Eng* * Oct 30, inset * Nov 13-**91** *E Rec* * Aug; Gov't. bld. *Eng* * June 10-**92**

Rope driving power transmiss., and cable, best speed of, Cooper, discuss. *Am M E* v 9 -**88**; two haulage systems, Norris *E Rec* * June 27 * July 18 *Am M E* * v 12; C. Hunt * v 12 -**91** *E News* * Nov 15-**90** *E & Min* * Jan 31-**91** *E Rec* Nov 15 *Pwr* * Dec -**90,** Jan -**91**; Grimshaw *Cassier's* * July, influence of longitude on, do. Oct; ed. *El Rev Lond* Sep 16-**92**; underground haulage, J. B. Smith *Eng* * Feb 17 * Mar 2, 23; Otto system haulage * Apr 6-**88**; Miller, diag. *E News* * Dec 6 *The Eng* Dec 19-**90**

Pwr Seymour * May-July * Nov -**89** * June * Sep -**90**; at Willamette mills, Portland, Or. * Jan -**92**; *Sc Am Sup* * Mar 24-**88**; by manila ropes, Gregg * May 24-**90** *J Assoc E Socs; Sc Am Sup* May 24-**90**; * Mar 24-**88**; *St R J* * Apr * Sep -**90.** See also POWER transmission; TELPHERAGE

Ropes, manila and hemp, strength and power transmiss., Miller, diag. *E News* * Dec 6; *The Eng* Dec 19; and hitches *E Rec* * July 19-**90**; strength of, Duboul, abs. *Inst C E* v 92 -**88,** do. expts., French *R Gaz* June 29-**88.** See also CABLES; WIRE ropes

Ropes Pass, Texas, Kent *E Mag* * June -**92**

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Kuichling, 13, 27, May 4; test borings by hand labor, outfit * May 11, Guthrie cor. * 25; experience in sewage, Lindley, July 6-**89**
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coef. formulas, Mansel, July 18; protection of, Barnaby, Dec 12-**90**, Jan 9; stresses in steel plating, Yates * May 22-**91**; the Santa Maria, flagship of Columbus * Aug 5; power transmiss. and distrib. in mod., Soliani, July 29, Aug 5, 26, (full) *Sc Am Sup* Dec 17-**92**

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Silver

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Silver
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Smithsonian Institution, Kay *Sc Am Sup* Oct 5-**89**. See also under SCIENCE
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Standards, J. W. See *Am M E* v 10 -**89.** See also WTS. and measures

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Steam

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INJECTORS. See INJECTORS

JACKETS. See ENGINES, steam jackets

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REDUCING valve, the Mason *Sci Am* Mar 9-**89**

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DOW'S compound motor *El Wld* * Feb 28-**91** *E News* * Feb 27-**92** *Pwr* * May -**91** *R Gaz* * Jan 24 *Sc Am Sup* * Apr 19 *The Eng* * Mar 14-**90** *J Assoc E Socs*

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YACHTS. See YACHTS, steam

Steamboats, on Rhine *The Eng* Aug 10; small pass., Plymouth harbor, Nov 9-**88.** See also STEAMERS, paddle

Steamers, ship's protection against foundering from injury to their shells and use of armor, Barnaby *Am Min* v 19 -**91**; points in the philosophy of, Durand *Cassier's* * Nov -**92**; building in Am., See *E Mag* * May -**91**

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Eng paddle, fast * Jan 9; laws of propul., Mansel, Mar 6; loading, effect of on form of vessels, Phillips * Apr 10; Atlantic records, early strs. 10, 24, May 1, 8, table, June 19, July 10; water-tight bulkheads in, ed. June 26; and yachts comparison, examples, A. Jones * July 3; oil-tank, Eldredge * 31, Aug 7; mercantile, types and proportions of, Martell, Aug 7, 14; bulkhead's spacing and construct., com. report * Oct 2; Atlan. liners, past, present and future * Dec 4-**91**

Eng water-tight bulkheads, Martell * Apr 15; steadying vessels at sea, Thornycroft * 15; the Atlan. ferry, its ships, men and working, Maginnis, bk. review, July 29; hydr. davitts, H. M. S. Vulcan * Nov 18-**92**; ocean, high speed in, Schieldrap *E & Min* Mar 1 *Sc Am Sup* Apr 19-**90**

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Inst C E ice-breaking, for winter nav., Runeberg * v 97 -**89**; Rhine goods traffic, Schnell, abs. v 99 -**90** * *Zeit Bauwesen* -**89**; the race across the Atlan., Dyer (prog.) *Littell's* Apr 23-**92** *Scot Rev;* Lloyd's register *Locom* Apr; fast Atlan. speed and dimens. June, July -**89,** Atlan. record (fast) Aug -**91**; design, experimental aid in *R & Eng* Dec *Sc Am Sup* Sep 28 -**89** *Steamship*

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Steamers

Oct 11, Dec 6-**89**, correction, do. cor. Oct 31-**90**, det. of coef. between power and speed, do. Apr 10, power expend. in and rel. effics. June 19, resistance of, Dec 11-**91**, propul. July 1, Atlan. liners, n Sep 2, paddle wheel and screw, compar. effic. Oct 7 -**92**

The Eng Atlan., ed. Aug 3, Turner cor. 31; iron and steel stern strengthening of, Sep 14-**88**; screw shafts repairing, str Tartar * Jan 18; Atlan. racing, ed. Sep 6-**89**; paddle, high speed * Aug 1-**90**; funnels, ed. June 19-**91**; L. Geneva pass. * Aug 5; Atlan., future of, ed. Nov 18, cor. Dec 2-**92**. See also MARINE eng.—boilers—engines; NAVIES; NAV., India inland; STEAMBOATS

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CITY of New York, Inman *Eng* * Mar 1-16, inset * June 22, machin. * Aug 3, 24: dimens. *E News* Aug 11; *R & Eng* * Sep *Sc Am Sup* * Apr 14 *The Eng* July 13, 27-**88**

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CONNECTICUT, Prov. & Stonington, inset *R & Eng* * Aug -**88**

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DUNOTTAN Castle, So. African mail *Eng* * Jan 2-**91**

ELETTRICO, pass. *The Eng* Nov 16, 16-**88**

EMPRESS of India, Can. Pac. R., inset *The Eng* * Sep 5-**90**

Steamers, FRIESLAND, Red Star liner *Eng* * Nov 8-**89**
FURST Bismarck, Hamburg-Am., twin-screw, insets *Eng* * Apr 1, 22-**92**
GLENGYLE and Glenshiel *The Eng* July 5, 5-**89**
GREAT Eastern, value to break up, n *E News* Dec 15-**88**; fate of, Jan 2-**92**; last days of (full) *Sc Am Sup* * Nov 28 *The Eng* * Oct 30-**91**
HYGEIA, paddle pass., inset *Eng* * Nov 7 *The Eng* * Oct 17, inset * Nov 7-**90**
IBEX, Great West. R., twin-screw *The Eng* Sep 18-**91**
INDIA, engines and boilers, inset *Eng* * May 1-**91**
IONA, trials, Kennedy report *The Eng* May 8, 22-**91**
ISLANDER, Napier, inset *Eng* * Sep 28-**88**
KOH-I-Noor, Thames excursion paddle *Eng* * July 15 *The Eng* * 8, 8-**92**
LANCASTRIAN, Leyland line *The Eng* Oct 30-**91**
LE Louvre, central screw *Sc Am Sup* * Nov 12-**92**
LORD of the Isles, Clyde pass., insets *Eng* * July 1, 15-**92**
LYDIA, Lond. & So. W. R. Channel str. *Eng* * Sep 4-**91**
LYNX, Antelope and Gazelle, Great West. R., inset *Eng* * May 30, engines and boilers * June 13-**90**
MAJESTIC, White Star line *Sc Am Sup* * Oct 11-**90**
METEOR, trials, Kennedy report *The Eng* * May 3, ed. 10, *Inst M E* pro. 17-**89**
MODJESKA, twin-screw, inset *Eng* * Oct 4-**89**
NOMADIC and Tauric, White Star, inset *The Eng* * July 24-**91**
NORMANNIA, Hamb.-Am. twin-sc. *Eng* Jan 31, inset * Aug 29 -**90**
OPHIR, Orient Stm. Nav. Co. (Austral.), twin-screw *Eng* * Dec 11 *The Eng* Sep 18, inset * Nov 20, 20-**91**
PARIS and Rouen, Lond. & Br. R., Channel *Sc Am Sup* * May 18, inset *The Eng* * Mar 15, Sep 13, 13-**89**
PELOTAS, Brazilian, engines and b's, inset *Eng* * June 10-**92**
PENINSULAR, Penin. & Oriental *Eng* Dec 7-**88**
PERU, Pac. Mail, launching curves of *The Eng* * Sep 16-**92**
PLYMOUTH, Fall River line *Eng* * July 31-**91**
PURITAN, Fall River line, steel, elec. light decorative features *El Wld* * Aug 3; Am. *The Eng* July 26-**89**; *Eng* * Jan 16, 23-**91**
RE Umberto *The Eng* Nov 2-**88**
ROME, Penin. & O., lengthening *The Eng* Oct 2-**91**
RUAHINE, New Zeal. Shipping Co. *The Eng* * Apr 1-**92**

Steamers, SCOT, So. Africa Roy. Mail, Union S. S. Co., twin-screw *Eng* * July 3, 10, 24 *Sc Am Sup* * Aug 8 *The Eng* June 5, insets * July 3, 10-**91** *Industries*

SPREE, No. German Lloyd *Eng* Apr 24-**91**

SULTAN, raising of, ed. *The Eng* Sep 13-**89**

TARTAR, speed trial, Mansel, n *The Eng* Dec 23-**87,** June 29-**88**

TEUTONIC, White Star, inset *Eng* * Dec 19-**90,** cor. Jan 9, (full) *Sc Am Sup* * Feb 7, 14-**91** *The Eng* Aug 9-**89,** inset (full) * Dec 19-**90**

TYNWALD, Isle of Man Stm. Packet Co. *The Eng* * Aug 28, inset * Sep 11-**91**

ULUNDA, raising *The Eng* * Mar 27-**91**

VILLE de Douvres, trial, Kennedy *The Eng* * May 13, 20-**92** *Inst M E*

WAESLAND, Red Star line *Eng* Dec 20-**89**

WHALEBACK, 'C. W. Wetmore,' Am. cargo *Eng* * July 31-**91,** Goodall * Apr 29-**92** *The Eng* * Aug 7-**91**

WHITE Star S. S. Co's *Eng* Jan 25-**89.** STEAMSHIPS, See STRS.

Steel, properties and use in structures and heavy guns, Metcalf, bk. *Am C E, E Rec* Dec 17, 31-**92**; and iron, compressive strength, Marshall *Am C E* Aug -**87,** abs. *Inst C E* v 92 -**88**; hardening, structural, Cunningham, discuss., inset (full) *Am C E* * v 27 -**92**

Am M E plates, injury by punching or shearing, Hawkins; temper, reduction by electro-plating and bending, Reese, discuss; tested shortly after rolling, Felton, v 9, 9-**88**; piping of steel ingots, Crane * v 10 -**89** abs. *Inst C E* v 97 -**89**; castings, Gantt *E News* June 20 *Am M E* * v 12; manganese-steel, Howe * v 12 -**91** *E & Min* * Aug 22 *Soc Arts Mass* -**91**; structural elastic curve and treatment of, Henning *Am M E* * v 13 -**92**; behavior, notes, and *The Eng* Mar 7, Apr 11, May 2-**90**

Am Min manganese-steel, method for es., Julian; colorimetric carbon test, inorganic standards for, T. Robinson; open-hearth, recent imps., A. Hunt (full) * v 16, 16-**88,** abs *Inst C E* v 94 -**88**; Henderson, Brainerd *Am Min* v 17 -**89**; open-h. manuf., notes, Shed, v 18 -**90**

Am Min Bess., sulphur in, Cabot; open-h., physical and chem. equations of proc., Campbell (full); German works and rolling mills, notes on imps., Daelen *E & Min* * Nov 8, 15-**90,** inset *Am Min* * v 19; Bess. proc., notes on, Howe (very full);

Steel

Darby proc. of recarburization, Thielen * v 19 -**91** *E & Min* July 5 * Oct 25-**90**, Jan 17, Apr 18-**91**, and ed. *E News* * Oct 18, 18 *Sc Am Sup* * Nov 22-**90**; ingots and moulds handling in Bess. works, Curtis; Imperatori proc. expts. at Croton mag. mine, N. Y., Nau (full) *Am Min* * v 20, 20 -**92** *E News* Oct 17-**91**; mild, fusion of, Carulla *Cassier's* Feb -**92** *Eng* Oct 23-**91**; recalescence in, E. Thomson *El Rev Lond* May 31-**89** *El Wld*

Eng manganese-steel, Hadfield, Sep 7-21, dis., insets (full) *Inst C E* * v 93 *Sc Am Sup* Apr 7-**88**; Brymbo works * May 10; hydr. pressure treatment, Greenwood, 17; Firming Co., at Paris exhib. * July 26; hardening and tempering of, Roberts-Austen, Sep 27, (full) *Sc Am Sup* Oct 26, behavior under stress, Carus-Wilson *Eng* * Dec 13-**89**

Eng alloys, Riley, Jan 24 *Sc Am Sup* Mar 22; manuf., Galbraith *Eng* May 23; aluminum in, Keep, 23; cost, Wright, Aug 22-**90**; basic, ed. Jan 30; ordnance tests for, Anderson, May 15, 15 *Sc Am Sup* June 6 *The Eng* May 15-**91**; 10 years produc., Great Brit. Mar 11; basic expts., White (full) June 3, 3-**92**

E & Min metallurgy of, Howe (very full) Jan 14 - * May 5, 19 * June 9-23 * July 7-21- Oct 6, 13, 27 * Nov 3-17 * Dec 8-22 -**88**, Jan 19, 26 * Feb 9, 16 * Mar 9-30 * Apr 13, 20 * May 11 -**89**, sup. (full) Jan, bk. review, June 28-**90**

E & Min steel making, cost in Ala., Phillips & Claghorn, Mar 2; compressing, Boulton ap., Crane * May 18; basic Bess. proc. in U. S., Phillips, July 13-**89**; Bess. practice, curious, Howe, June 28, in Robert vessels, notes, Aug 30; open-h., novelties in procedure, Howe, Sep 13, Bess. proc. notes, do. * Oct 4, how invented and perfected, H. Bessemer, 11-**90**

E & Min U. S. produc., census, Nov 8-**90**, '90, Jan 3; det. of carbon in, Blair, Apr 4; steel making in U. S. before 1810, Durfee, Nov 7 *Pop Sci* Oct; low, tests and experience (Prussia), Mehrtens report * Dec 12-26-**91**, abs. *Inst C E* v 110 -**92**; basic, world's produc. '91, n *E & Min* May 21; steel billets cost, compar., U. S., Great Brit. and Europe, Oct 1; basic Bess. plant, Pottstown I. Co., Hartshorne * Nov 5-19-**92**

E News direct proc. tests * Jan 21; 20 years of open-h. experience, Koch, June 9-**88**; tests (Carbon I. Co.) Apr 6; drifting tests of structural * 27, May 18; hydr. pressure treatment, Greenwood, July 6, dis., inset (full) *Inst C E* v 98 -**89**

Steel

Sc Am Sup Aug 10 *The Eng* May 24; making in England *E News* Sep 7; soft, severe tests of * 28; open-h. bridge manuf., Shed, Oct 5-**89**; testing, rate of speed in, Flint, Apr 19; mild, made by Thomas proc. 26; Henry Bessemer's story of invention of Bess. proc. Oct 18; Edgar Thomson works and blast furs. * Nov 1; produc. 1880-90, Cens. bull. 8-**90**

E News hardening of surface, Haney proc. * Oct 24-**91**; mild, for structural purposes, Henning * Jan 2-16, Craighill cor. * 30; soft, in bridges, Apr 2; soft, bending tests and proofs of qual., Kreuzpointner * May 12, fire-box *R Gaz* May 27; cost *E News* * July 28; open-h. and Bess. * Sep 15-**92**

E Rec basic, expts. with, Aug 20; plate punching expts., Benjamin, Dec 24 *R Gaz* Nov 11-**92** *J Assoc E Socs;* Bess. manuf., R. Hunt *F Inst* * May -**89**; Robert-Bess. proc., Metallur. arts at Paris exhib., Garrison * Oct -**90**

Inst C E open-h., use and testing for boiler-making, Goodall, discuss. (full) * v 92; Terni works, Italy, ed. *The Eng* Nov 23, machin. of, Savage, insets *Inst C E* * v 93; mild, effect of rolling and wire-drawing, H. Allen * v 94 -**88**; Bess. proc. at Nischnje Saldensk, Ghrum-Ghrzhimailo, abs. v 100-**90**

Inst M E and steel guns, Chernoff, July **91**; U. S. produc. '87 *Locom* Mar -**88**; phosphorus det. in, Dudley *R & Eng* * Dec -**92**; bars, plain and twisted, rel. strength tests, Gilmore *R Gaz* Mar 15-**89**; cost and st. rails, Wright report, Feb 20; castings, good and bad, ed. * July 24-**91**

Sc Am Sup at Glasgow exhib. Sep 15 *The Eng* July 27, Nov 2-**88**; heat treatment of, Howe (full) * Apr 6-**89**; U. S. produc., Sweet, Nov 22-**90** *Cens Bull* 13; aluminum-steel, Hadfield *Sc Am Sup* Apr 4-**91**; open-h. castings, Herrick, Mar 26 -**92** *Iron Age;* domestic steels for naval purposes, Eaton (full) *Soc Arts Mass* -**90**; elastic limit momentary depression at two critical temps., Howe *Tech Q* Dec -**88**

The Eng Bess. converter controlling ap., Watts * June 6; U.S. produc. Nov 14; basic open-h. manuf., Davis, Dec 19-**90**, dis. Jan 23; Dowlais works, at Cardiff, England * Nov 13-**91**.

See also ALUMINUM-steel; IRON and steel; RAILS, steel, manuf.

Steel trellis machine *Eng* * July 25-**90**

Steel, William H. *Inst C E* v 100 -**90**, 103 -**91**

Stenotelegraph, the Cassagnes, Chenut *El Wld* * July 19-**90**

Stephens, Frederick C. *Inst C E* v 96 -**89**

Stephenson, Henry P. *Inst C E* v 101 -**90**
Stereotyping, quick proc. *Locom* June *Paper Wld, Sc Am Sup* Aug 4-**88**; Bolas (full) Oct 25 * Nov 1-**90,** Feb 21-**91**
Stevenson, George W. *Inst C E* v 99 -**90**
Stevenson, Thomas *Inst C E* v 91 -**88**
Stileman, Francis C. *Inst C E* v 98 -**89**
Stock (quotation) printer, the Wiley *El Wld* * Jan 14-**88**
Stokers, aut. conveyor *Eng* * June 14, 28; Roney *Pwr* * Aug *St R J* * Aug -**89.** See also BOILERS, stokers; MECHAN. stokers
Stollmeyer, André B. *Inst C E* v 107 -**92**
Stone, Mason's stone-breaker *Eng* * Nov 25-**92**; Gov't. contracts *E News* June 2; and cement, crushing strength, Baker, 23-**88**; cost of dressing, Cooke, Dec 13-**90**; cements and bld. material, method of testing resist., Durand-Claye *E Rec* May 11, abs. *Inst C E* v 95 -**89** *An Ponts* * v 16 -**88**; stone-cutting and quarrying by wire, abs. *Inst C E* v 95 -**89**; sawing machines, abs. v 106 -**91**; Ark. syenites tests, Wins *R & Eng* Jan -**91**; artificial 'Ferroid,' Poole *Sc Am Sup* Nov 8-**90** *J Assoc E Socs;* circular saw *Sc Am Sup* * May 2-**91**; artif. silica making, Aug 20-**92.** See also BLUESTONE; BUILDING stones; GRANITE; LIMESTONE indus; SLATE, etc.
Stone, Charles S., Raymond *Sc Am Sup* Mar 23-**89** *E & Min*
Stone, Thomas W. *Inst C E* v 109 -**92**
Stoneware, adaptation to chem. ap., Rix *Sc Am Sup* * July 25 * Aug 1; manuf. Orton, Dec 19-**91.** See also EARTHENWARES, porous
Storage batteries, elec., or accums., Salom *Am Min* * v 18 -**90**; Reckenzaun *El Rev Lond* Jan 6, June 22, July 6, 13, Aug 3, 24, Nov 9 *El Rev* Dec 1-**88** *Sc Am Sup* Feb 2-**89** *El Eng* Sep, Oct -**88,** Jan; litigation, Apr; defects of lead secondary, Duncan * June *El Rev Lond* * July 19, dis. (full) *E Wld* * June 15-**89** *El Eng* in train lighting, Brown, dis. July; regulating accums. in elec. lighting, methods, Prescott (very full) * Nov, (full) *El Rev Lond* * Nov 22, 29, Dec 6, (full) *El Rev* * Nov 9, (full) *El Wld* * Nov 9, dis. 23; chem. of, Frankland, Oct 25-**89,** Aug 22-**90** *El Rev* Nov 2-**89,** expts. Sep 20-**90** *Sc Am Sup* Nov 2-**89,** Nov 1-**90** *El Eng* Nov, Dec -**89**
El Eng working effic. of secondary, Ayrton, Aug 13, (full) *El Rev Lond* * July 18, 25 * Aug 1. 8, (full) *El Wld* * Aug 9-30 *E News* * Sep 6; aut. reg. of accum. circuits *El Eng* * Oct 1; Elec. Stor. Bat. Co's system * 8-**90**

Storage batteries

El Eng chem. of, Ayrton * Jan 7-**91**, (full) *El Rev Lond* * Nov 28, Dec 5-19, (full) *El Wld* * Dec 13-**90**; (second.) Robertson *El Rev Lond* Dec 11-**91**, (full) *El Wld* * Jan 9-23, (full) *Sc Am Sup* * Jan 23 *Soc Arts Lond*, *El Eng* Jan 13; Am., Donaldson-Macrae, n * Apr 20-**92**

El Rev Lond (accums.) Waltenhofen, Oct 19, abs. *Inst C E* v 94 -**88**; Hoppe, bk. review, *El Rev Lond* Nov 30-**88**; alkaline accums. Jan 18 *The Eng* 18; sec. and secondary curs., Parnell *El Rev Lond* Feb 22; litigation, Apr 12; ed. May 10; traction, Bracken, Aug 30, Bell, Oct 18; at Paris exhib., Reckenzaun * 25 *Sc Am Sup* * Dec 14-**89**

El Rev Lond (accums.) management, Pumpelly, Apr 25, July 4 *El Wld* Apr 12, 26, May 31, July 14-**90**; in commercial work, index references to periodicals, J. S. Brown, Dec 5 *El Rev Lond* Dec 25-**91**; causes of changes of elec. mo. force, Gladstone * May 27 * June 3; chem. of lead accums., Darrieus * June 10-24, trial, Aug 5; Epstein accums. tests, July 29; indus. accum. Nov 4-**92**

El Rev Mut. Elec. Mf'g Co. * July 20-**89**; gelatinous electrolytes for, Schoop, Aug 9 **90**; researches, Streintz, Jan 24 -**91**

El Wld machinery for manuf., Madden * Oct 27-**88**; Bates, Feb 9; Preece (full) May 25; influence of density of acidulated water in, Paget, June 15; Dallas, July 13-**89**; elec. plants cal., Bracken's accum. diag. * Nov 15-**90**; Frankfort exhib., Hering * Nov 21-**91**

Eng accums. vs. transformers, May 25-**88**; *E News* * May 25-**89**; power, cost, Kapp *E Rec* Mar 7; new accum. plate, Pike *F Inst* * Apr **91**; traction *R Gaz* Dec 30-**92**; *Sc Am Sup* Mar 2-**89**. See also R's, elec, storage bat.

ACCUM. Co. vs. N. Y. & Harlem R., decis. *El Wld* Apr 23-**92**

BRUSH, windmill accum. plant *El Eng* * Dec 24-**90**; pat. July 29-**91**; legal decis. (full) *El Rev* Mar 29-**90**; suit, Aug 1, pats. 15-**91**; Elec. Accum. vs. Julien Coxe's decis. (full) *El Wld* Mar 30-**89**, Mar 29-**90**, Aug 1-**91**; effic., Higgins *Tech Q* * Dec -**87**

DESMAZURES accums., Reynier, abs. *Inst C E* v 92 -**88**

DETROIT, the, tests, Duncan *El Wld* * Mar 23 *Sc Am Sup* * Mar 9-**89**

JULIAN accum. *El Rev Lond* * Jan 6-**88**

Storage batteries, KHOTINSKY accum. *El Eng* * Sep 14, 21, 28, Oct 5 biog. sk. * Nov 9-30-**92**
KNOWLES distrib. system *El Wld* * July 20, plates, Oct 12-**89**
LACOMBE bat. decision *El Wld* Nov 9-**89**
LAURENT-Cely accum. *Eng* * Mar 28-**90**
MACRAEON'S *El Wld* Feb 9-**89**
SCOTT-Sisling charging system *El Rev* * Sep 26-**91**
TUDOR accums. in cen. stations, Schoop *El Eng* * Nov 16-**92**
WADDELL-Entz system *El Wld* * May 16 *Sc Am Sup* * June 6 -**91**
WINKLER, the *El Wld* * Apr 9-**92**
Storms, Am. tornado of *Eng* Mar 27, Apr 25-**90**; conditions causing tornado, Hazen *E Mag* * Oct -**91**; meteorol., a contrib. to, Tatham *F Inst* June; hail-storm at Phila. Oct 1-**89,** Houston, Nov; and rain, Hazen *Sc Am Sup* June 15-**89.** See also RAINFALL
Stothert, John L. *Inst C E* v 104 -**91**
Stoves, effic., Lunge *The Eng* Sep 6-**89** *J Soc Chem Ind.* See also GAS-stoves; MALT drying stove
Strain, Charles J. *F Inst* May -**92**
Strains, measurement of, Mallock *Eng* * Nov 21-**90.** See also TESTING machines, etc.
Street railroads, Rap. Tran. Commiss. report to Mass. Legislature, Apr 5-**92**; stats., cens. bull. *El Wld* May 9; elec. cars speed in city sts., Hewitt * Dec 19-**91**; accidents, N. Y. city, ed. *E News* Mar 10-**88,** inc. in, ed. July 11-**91**
E Rec and pavements, Stayton, Dec 3-31-**87,** Jan 7, 21, Feb 4, 25, Apr 7, May 26, June 9, 16, Oct 13, Dec 8, 29-**88,** Apr 13, June 8, 15, Aug 3, Sep 14, Oct 5, Dec 7-21-**89,** Jan 4-**90**; Fairchild, bk. review, Aug 20-**92**; elec., in cities (extent) *R & Eng* Nov -**90** *El Eng;* cost of op., cens. bull. *R Gas* May 22; sociology of, Cooley, Oct 23; and steam, rel. value, tables, Mansfield *Soc Arts Mass* -**91,** (full) *St R J* May -**91**
St R J taxation, W. Smith, Nov -**88**; conductor's way-bill * Apr -**89**; horse trams, Fairchild (full) * Oct * Dec; public and state treatment of Co's, Nov -**90** *Scribner's*
St R J notes (various cities) Jan; charters, franchises, stocks and bonds, Fairchild (full) Apr; Boston and foreign cities compared, Whitney, May, June; op., rules, Fairchild (full) June; the car mile unite, Bowen, Sep, cor. Oct; foreign notes, Frankfort elec. exhib. Nov -**91**

Street railroads

St R J accounts forms, Jan, Mar, bk-keeping, Fairchild, July; U. S. mileage and cars, '90-91, table, Apr; taxation, May; a model roadbed and wiring, Baumhoff report, Nov; Security car fare register, n * Dec; traction cost, Brunton cor. *The Eng* Sep 30-**92.** See also BREWERY tramways; R's, elec; TRAMWAYS

AM. Assoc. pro., Buf. (full) *El Rev* Oct 25-**90**; Oct 24, 31-**91**; Cleve. (full) Oct 29-**92**; *El Wld* Oct 26-**89**; Buf. (full) Oct 25-**90**; Pitts. (full) Oct 31-**91**; report, Oct 29-**92**; *E News* Oct 27; *R Gaz* 28-**92**; (full) *St R J* Nov -**88**, Nov -**89**, Oct, pors. * Nov -**90**, Nov -**91**, souvenir sup., pors. * Oct, Nov -**92**

BERLIN tramways *St R J* Nov -**91**, traffic, May -**92**

BERNE, Mekarski system, Bertschinger, abs. *Inst C E* v 105 -**91** *Schweiz Baus* -**90**

BOSTON, West End, elec. *El Rev* * Aug 27; report abs. Nov 19 -**92** *El Wld* Aug 20, Nov 19-**92**; and foreign cities compared, Whitney, abs. *Inst C E* v 99 -**90** *El Eng*, *St R J* May, June -**91**; report, Dec -**90**; * May, Dec -**91**; report, Dec -**92.** See also R's, elec., Boston

BROOKLYN (full) *St R J* May -**92**

CAR-houses and stables, location and construct., Wyman *St R J* Nov -**88**

CARS, car-gear for mod. speeds, self-propelled car, Macfarren *Am M E* v 11 -**90**; Robinson radial *El Eng* * Oct 1-**90**; safety fender *E News* * July 26-**90**; fenders for, Swain * Feb 21-**91**; Pullman's *R & Eng* * Nov -**92**

St R J Dewey's elec. heater * July -**89** * Jan; Burton elec. heater * Feb -**90**; center aisle open * July -**91**; car building, Fairchild (full) * Mar * Apr; car brakes, Van Vleck * Apr; West End fender, Boston, n * Nov -**92**; sleeping car *Sc Am Sup* * Jan 28-**88**

CAR starters *E News* * Jan 11-**90**; Akers & Lindsey's *Sci Am* Mar 2-**89**; Anspach cor. *St R J* * Feb **90**; Vereker & Yeates' *The Eng* * Aug 16-**89**

CHICAGO, report *E News* Jan 31-**91**; West, map *St R J* * July; City * Aug, Mil. ave. power plant * Sep -**89**

CLEVELAND *St R J* sup. * Oct -**92**

CURVES, spiral or transition, effect to reduce shock, Woolley *E News* Nov 1-**90**; transition, Balt. * Nov 10-**92**; and switches, measurements of, Rydler *St R J* * Oct -**89** * Mar; tramway spiral, Gribble * Oct -**90.** See also R's, curves

Street railroads, EUROPEAN, stat. *E News* Feb 2-**89**; practice Howes, Nov 21-**91**

GERMAN *E News* Oct 13-**88**; *St R J* May -**91**

GREAT Brit., and tramway working, ed. *Eng* June 22-**88**; England, cost of traction *E News* Oct 24; and Ire. *St R J* May; Great Brit. & Ire. Tramways Inst. Aug -**91**

HORSES' feeding *St R J* May -**88**; horse power cost, State Engr's report, table, Nov -**90**; stable notes, Nov -**91**

KANSAS City, extent, *E News* Jan 19-**89**; rap. tran. *St R J* * Mar -**90**

LIVERPOOL, McGhie *St R J* June -**92**

LOCOMOTIVES, compressed air, Hardie cor. *Eng* June 8-**88**; meter g. tramway, Paris exhib., inset * Dec 27-**89**; English *E News* Mar 1-**90**; steam, Brussels exhib. *The Eng* Oct 19-**88**; Belpaire steam tramway engine * May 31-**89**

LONDON tramways *St R J* Aug -**91**

MASS. stats. n *El Wld* Mar 19-**92**; R. Com. report *R Gaz* Feb 21-**90**; traffic growth, Mansfield *St R J* May; legislation, July -**91**; reports, Jan -**92**. See also ST. R's, Boston

MOTIVE power, Sears, *Cassier's* Oct *Am C E* v 27 -**92**; compressed air, Jacobus *E Rec* July 11 *Am Min* * v 19 -**91**; elec., com. report (full) *El Wld* Sep 26-**91**; the Mekarski compressed air tram-car *Eng* * Mar 23-**88**; low pressure air motor for, ed. * Mar 14, 21-**90**; comp. air for, Haupt *E Mag* Aug, Sep *R Gaz* Aug 19-**92**

E News the Mekarski comp. air, Lond. * May 12-**88** * May 24, 31-**90**; Judson pneu. propulsion system, Oct 26, inset *St R J* * July; stor. bats. and motors, Dec 7-**89**; for cities, table, Aug 30; mixed methods, Ontario, Cal. * Dec 13; comp. air, Nogent tramways, Demoulin, abs. *Inst C E* v 99 -**90**

Sc Am Sup Connelly gas motor * Oct 6, *The Eng* * Sep 30 -**92**, *St R J* * Sep -**88**; motors other than animal, cable and elec., Winsor report, Nov *St R Gaz*, *Sc Am Sup* Nov 16-**89**; Rowan's motor for cheap traction * Jan 9-**92**; compressed air propul. Chester * Apr 26 *The Eng* * Mar 21-**90**; first principles *St R J* * May; elec., finan. conditions of success, Barr report, Nov -**89**; steam, air and gas trams, Fairchild (full) * Jan; mo. power, a standard of comparison, Hampton * Mar -**91**. See also CABLE R's; COMPRESSED air motors; GAS motors; R's, elec.

Street railroads, MULHAUSEN-Ensisheim tramway, Dollfus, abs. *Inst C E* v 91 -**88** *Bull Soc Mul* July, Aug -**87**
NEW York city & Brooklyn, cost of op., table *St R J* July -**91**; June * Aug, Sep -**92**
NEW York State Assoc. pro. *El Rev* Sep 27-**90**, Sep 26-**91**, Oct 1-**92**; *El Wld* Sep 27-**90**, (full) Sep 26-**91**; (full) *St R J* Oct -**88**; op. expenses, table, Aug; sup. Sep 15, Oct -**91**; Oct -**92**
PARIS, King *St R J* * May, building and repair shops, do. * July * Aug * Nov, Dec -**91**
PITTS. & Allegheny, Pa., map *St R J* * May -**90**
RAILS, continuous rail joint *E News* * Apr 21; * May 12-**88**; B'way Cable * July 18-**91**; White's * June 14, section, B'way and 3d ave. cable tracks * Aug 9; the Gibbon duplex * Nov 15 -**90**; standard rail head, Nov 3-**92**; Johnson girder, works *St R J* * June -**90**; expan. of continuous, expts., Moxham * Nov -**92**
RICHMOND Union pass., inset (full) *St R J* * June -**88**
ST. Louis, map *St R J* * Feb -**90**
SIAM, City of Bangkok, Westenholz *St R J* Aug -**91**
SYDNEY, New So. Wales, rap. tran. plans *St R J* July -**92**
TRACK, imp., Tratman *E News* July 20-**89**, insets (very full) *Am C E* * v 22 -**90**; Gribble, dis., insets (very full) * v 24-**91** *E News* * Dec 20-**90** *St R J* Feb, Gibbon * Apr, May -**91**; White's *E News* * June 14-**90**; wear, Arnall * Sep 8-**92**; Gibbon's duplex * Nov 15-**90**, com. report, insets *F Inst* * June -**92**; permanent way, More (full) *Inst C E* * v 103 -**91**; construct., Fairchild (full) *St R J* * May * June -**92**. See also ST. R's, rails
TRAMWAY Inst. of Great Brit. & Ire. pro. *St R J* * Aug -**92**
SWITCHES, the Rowell *El Wld* * Oct 19-**89**; turnouts, Harrington, Nov 19-**92**; switchwork, Detroit *St R J* * June; measurements of, Rydler * Oct -**89** * Mar -**90**
VINCENNES-Ville Evrard comp. air *Sc Am Sup* * Mar 17-**88**
WASHINGTON, D. C., map *St R J* * July -**90**
Streets, numbering plan, Chic., proposed *E News* Nov 16-**89**; dept., N. Y., Feb 1; cost of lighting, Kansas C. June 28; subways at B'way and Fulton sts., N. Y., inset * Nov 1-**90**; the ten-block system for numbering country houses, Bancroft, Jan 31; cleaning, Paris, Jan 17, Aug 22 *Sc Am Sup* Sep 5 -**91**

Streets

E News grades fixing, Aug 25, cor. * Sep 8; cleaning, cost and methods of paying, Washburne report, 29; cleaning, Phila., '91, n Nov 10-**92**; use of pub. ways by private corporations, Powers *Arena* May -**92**; st. digging *Eng* * Sep 26-**90**

E Rec construct. and care, Greene, Mar 1, 8, cleaning cost and methods, 1, 8; lighting, N. Y., Love, Apr 5; cleaning and refuse disposal, Nov 29-**90**; cleaning, com. report, Mar 28, Wash., D. C. Oct 10-**91**; dept., Boston, report, Apr 23-**92**

F Inst and pavements, Haupt, Dec -**89**; watering and use of sea-water for sewer flushing and san. purposes, Cockrill *Inst C E* v 110 -**92**. See also under names of cities; ELEC. wires, underground; MUNIC. eng; PAVEMENTS; ROADS; SEWERS; WATER-works

Street sweeping machine, Valentia, Spain *Sc Am Sup* * Mar 24-**88**

Stress and strain defined, ed. *E News* June 2, cor. 9-**92**; stress-diags. of solid structures, R. H. Smith, inset * *Inst C E* * v 96-**89**

Strike, cost of a, C. B. Q. R. *Eng* June 28; London laborers, ed. Sep 6-**89**. See also LABOR

Stivolinski, Ferdinand de, por. *E & Min* * Oct 31-**91**

Strong room, steel, for Spain *The Eng* * Oct 2-**91**

Stroudley, William (full) *Inst C E* v 99 -**90**

Struggle for existence, ed. *Eng*? Feb 10-**88**

Struts, strength of, McCabe cor. *R Gas* * Apr 22-**92**

Stubbs, William H. *Inst C E* v 102 -**90**

Submarine mines, Bucknill *Eng* Nov 28, Dec 5-**90**. See HAR. eng

Sudden phenom., observation of, Langley *Sc Am Sup* * Sep 7-**89**

Sugar, works, Auckland, New Zeal. *Eng* Feb 3-**88**; machin. imps. *E & Min* * July 5-**90**; sorghum, indus., Cowgill report *Sc Am Sup* * Feb 18; beet and indus., Gehring (full) Sep 29-**88**; chemical, July 20-**89**; manuf. in Cuba, July 26; synthetical expts. in sugar series, Fischer, Sep 13-**90** *Am Chem J*

Sc Am Sup sugars, standards for polarimetric es. of, U. S. report, Crompton * Oct 3; making by diffusion proc., Stubb's report * 24; sugar items, Dec 12-**91**; cane, juices class., Deeming, July 16; Demerara produc., 20 years imps., Bellairs, Sep 24 -**92**; cane, influence of temp. on spec. rotation of, det. by Polariscope, Andrews *Tech Q* May; sugar mill rollers *The Eng* * Nov 29-**89**

Sulphite pulp, in Am., n *Sc Am Sup* Aug 2, boiling, Dec 6-**90** *Chem Tr J*; fiber, see LIME sulphite fiber manuf.

Sulphur, dioxide, De V. Wood; expt. det. of latent heat of, Jacobus *Am M E* * v 12, 12 -**91**; deposits of So. Utah, du Faur *Am Min* July -**87,** abs. *Inst C E* v 92 -**88**; mines of Sicily, duration of, abs. v 91 -**88,** Carroll report *E & Min* Sep 1, 8 *Sc Am Sup* May 26-**88**; spec. resist., Monckman *El Rev Lond* Dec 28-**88**

E & Min produc. in Sardinia, Mar 30-**89**; volumet. es. in burnt pyrites, Watson, May 24-**90**; produc., Adams, Jan 2-**92**; physiol. and therapeut. action of, Shoemaker *Sc Am Sup* Oct 4-**90.** See also UTAH, sulphur

Sulphur Is., New Zeal., Macivor *E & Min* June 2-**88**

Sulphuric acid, 20 years prog. in concent. of, Adams *Am Min* * v 16 -**88**; sulphurous acid manuf. in Upper Silesia, Eilers * v 20 -**92**; sulphuric acid and alkali manuf. prog. *E & Min* May 24-**90,** and sulphurous manuf., Brit. alkali trade notes (full) * Apr 11, 18-**91,** sulphuric (manuf.) Newbury *Sc Am Sup* Apr 27-**89** *Am Chem J.* See also CHEMISTRY, sulphuric acid

Summers, Thomas *Inst C E* v 96 -**89,** v 99 -**90**

Sun, solar radiation intensity, compar. with elec. arc, Langley *El Eng* * Jan -**90**; sun-dials for low latitudes, Cumine *R & Eng* * July -**91** *Sc Am Sup* * Feb 4-**91** ?; discov. of platinum, Hutchins, Jan 14; distance and constitution, June 2; energy util., Weston's ap. * Dec 15-**88**; solar surface in last ten years, Perry, Sep 21-**89**; sunheat and sunlight, Rogers, June 14-**90**; a great magnet, Hiscox * Aug 20; total eclipse, 1893 * Dec 3-**92**; photog. of solar prominences, Hale *Tech Q* Nov -**90.** See also ASTRON; SOLAR

Sun motor, Ericsson *R & Eng* * Sep *Sc Am Sup* * Sep 15-**88** *Nat.*

Surveying, N. Y. State, final results of triangulation of, Weed, Parsons, Albany, '87, bk; bench marks, expts. on stability of, Cooley, dis. *Am C E* v 20 -**89**; deep rock cuts, method of taking cross-sections in, by triangulation, Watkins, insets * v 22 -**90**; imaginary boundaries, Raymond *Am Min* * v 18 -**90**; photographic, and co-ordinate, Stanley (full) * v 20 -**92** *E Rec* * July 2-**92**; the ordnance, methods and proces., Wilson *Eng* Feb 27-**91**; U. S. Geolog., costly, Wolcott *E Mag* Nov -**92**

E News New Jersey state survey, Apr 14; transit field notes keeping, best method, cor., ed. Sep 29-**88**; plotting contours. Lorini, cor., diag. * Feb 23; making topog. relief maps, cor 23; resurvey of So. Amboy, N. J., Hill * Apr 13; traverse, Bassell cor. * Dec 7-**89**

Surveying

E News field-books, notes, Rothwell, Apr 5; acreage table for comput. right of way areas, June 14; grades at st. intersections, cor. * 21; Brit. ordnance, Oct 18; prob. * Nov 1; the Porro telescope for stadia work, J. B. Johnson * 8-**90**; Roanoke, Va. * Jan 9 * June 23; field sheet for topog. work * July 28; surveyor's qualifications, Gov't. Cape Col., So. Africa, Aug 4-**92**

E Rec how to tell a good instrument, Lietz, Apr 11; St. Louis, Mo., topog. Oct 3-**91**; topog. methods, K. Allen * Feb 6-**92**; Tacheometry, or rapid, Brough *Inst C E* * v 91; plane-table, econ. use in topog., Pierce, dis., inset (full); chaining, imp. systems, W. Thompson *Inst C E* * v 92, 92 -**88**

Inst C E Hawaii, Windward, prelim. in new countries, Gribble; rapid, Topham; in Australian colonies, Vickery, v 95 -**89**; by vertical angles, probable errors, Airy; triang. errors, short method of distrib; France, leveling, Jimels, abs. * v 101, 101 -**90** *Genie Civil* v 17 -**90**

Inst C E land, astron. as applied to, Downes * v 108; spirit leveling of Switz., Messerschmitt, abs. v 109 -**92** *Schweiz Bauz;* Italy, geodetic map *R & Eng* * Nov -**88**; France, geodetic work, Aug -**89**; prob. * Dec -**90**; hand telescope for stadia-work, Richards *Tech Q* * Apr -**92**. See also INSTRUMENTS; TUNNEL surveying

Swallow, James S. *Inst C E* v 101 -**90**

Sweet, John E., por. *Cassier's* * Apr -**92**

Switzerland, stat. *E News* Aug 3-**89**

Sylvanite mine, Col. *E & Min* * Dec 15-**88**

Sylvester, James J., por., Cayley (full) *Sc Am Sup* * Apr 13 -**89**

Szegedin, Town of, reconstruction (after flood), Stübben, abs. *Inst C E* v 92 -**88**

Tabulating, elec., Hollerith system, com. report *F Inst* * Apr -**90**; statistical tab. by machinery, Pidgin *Soc Arts Mass* -**89**. See also CENSUS taking

Talc *E & Min* May 25-**89**

Talking machine. See PHONOGRAPH

Talman, James J. *Inst C E* v 110 -**92**

Tank sluice with equilib. valve, Larmunie *E News* * Feb 14 **91**

Tannin, chestnut wood bark, Trimble *F Inst* Oct -**91,** May -**92** *Sc Am Sup* Nov 14-**91**

Tanning, elec., Worms & Bale ap. *El Eng* * Nov 26; creosotic acid employment in, Hauff *Sc Am Sup* May 3; anal., Muter * Sep 6-**90**; materials of Europe, May 23; by aid of electric., Rideal (full) * Aug 8-**91**; plants capable of yielding materials, Mafat, Oct 8-**92**; applic. of alpha-sulphonic acid of naphthaline to bating and puring of hides, Burns *Tech Q* July -**91**; theory and practice, Salomon, Apr -**92.** See also ELEC.—LEATHER tanning

Tarbotton, Mariott O. *Inst C E* v 91 -**88**

Tar furnace, Anderson *Sc Am Sup* * Feb 11-**88**

Tariff and the constructive arts, Thurston *Cassier's* Jan -**92**

Taxes, U. S. *E News* June 1-**89**

Taylor, John *Inst C E* v 109 -**92**

Teaching of science, com. report (full) *Sc Am Sup* Jan 25, Feb 1-**90.** See also SCHOOLS; SCIENCE

Technical Soc. of Pac. Coast, Geldern, pors. *Cassier's* * Oct -**92**

Telegrams and storms, Slingo *El Rev Lond* Jan 23, 30, Feb 6-20-**91**

Telegraph *El Eng* wire, hard drawn cop., durabil., Maver, Apr -**88**; line adjust., Delany * Dec *El Rev* * Nov 30 *El Wld* * Apr 27 * Nov 30, multiplex, new sys., Patten's (full) *El Eng* * Mar-**89** * June 18; circuits, Jones' main office * Dec 17-**90**; writing tel. * June 3-**91**

El Eng mod. Am. ap., F. Jones * Mar 30, May 25 * June 22 * July 27 * Aug 3, 17; wire joints, breaking strain in hard drawn cop., Jones, June 1; type, the Am. n * July 27; cable, Burke relay and transmitter * Dec 7-**92**

El Rev Lond R. survey system, Gilbert * May 18; transmiss. limit, Moon, Aug 10; submar. cables and ocean temps., Bright, Nov 16-**88**; cables, of world, Feb 15; Siemen's recording ap. for compact Morse writing * Mar 8; Submar. Co. 29; ocean probs. and conditions, Apr 5; trans-atlan. cable routes * Aug 2, map *El Wld* * July 27; high vs. low speed, finan. compar. *El Rev Lond* Aug 16, Linckens *El Rev* Sep 7; cable manuf. early hist. *El Rev Lond* Dec 13-**89**

El Rev Lond submar. cables, aut. reversal signaling on * Feb 7; protection, lightning guards, Lodge * May 16-30; elec. curs. in conductors, Bennett * July 25; sub. cables, interrupts. and repairs, '88 89, table, Aug 22-**90**; prog., '96, Feb 6, in England,

Telegraph

Preece, Sep 18; sub. cables, India-rubber core in * Mar 20; pictorial * Dec 4-**91**; ap. constants, Moon, Apr 29; sub. cables, double differential relay, Raymond-Barker * July 22-**92**

El Rev hist., Vail May 5 *Century* Apr -**88**; cables, broken ocean, Oct 5; multiple, synchronism in, Morse, Nov 16; cable manuf. hist., Barrett, 23-**89**; tournament (fast sending) * Apr 12, 19; curs. in conductors, obs., Bennett * Aug 23; writing, prins. of, Morse * Nov 15-**90**

El Rev and telephone, inventors of, Gray addr. Apr 18 *El Wld* 25 *E Mag* June 20 *Sc Am Sup* 20; and pat. stats., Brit. *El Rev* June 27; musical, Hachenberg, por. * Nov 14; a pub., Hale, Dec 5-**91** *Cosmopol;* in Am. *El Rev* Feb 20-**92**

El Wld dynamo-elec. machines in, West. Un. bld., Maver * Feb 11, 18; quadruplex, imps. do. * May 19, 26 * June 2, cor. * Oct 27; trans-pac. cables, proposed, table, July 14; Gray telautograph * Aug 11; with pulsatory and undul. cur. sigs., Maver * 25 * Sep 8, 22 * Oct 6; and telephony, Jacques' simul. system * Nov 17-**88**

El Wld ocean probs. and conditions, Weatherbee * Jan 26; imperfect earth in circuits, phenom., Kenelly * Mar 16; line construct., Paris exhib. * Nov 9-**89**; quadruplex, Healy * Jan 18; submar., Webb (full) Mar 1, (full) *Sc Am Sup* Apr 19; fast sending contest *El Wld* * Apr 19; signaling across rivers, India, Melhuish * May 10; nationalizing, Wiman, Dec 30 -**90**

El Wld electric., galv., mag. and teleg., chron. hist., Mottelay (very full) * Apr 18-Dec 26-**91**, Jan 2-Feb 27, Sep 3, pors. * 10-Oct 22-Dec 31 etc. -**92**; the phonopore, Langdon-Davies *Sc Am Sup* * May 18 *The Eng* * June 21-**89** *El Wld* * Mar 7; and teleph. indiv. selection on elec. circuits call sys. * July 11; Gov't., Rosewater (full) Dec 12, Gov't. control, Foote, 19 -**91**

El Wld pictorial, Trotter * Jan 16; the Wentz line adjuster, Rosenbaum * Feb 20; lines earth cur. disturbs., Finn * May 14; cable relays, Judd * Nov 5-**92**; multiplex, the phonophore *Eng* * Apr 19; at Paris exhib. * Aug 16, 23 * Oct 11, Post Office, Oct 25, Nov 1-**89**

E News the Am. inventors of the, ed. Apr 14, birth of the elec. 21; the Finley helio-teleg. 28-**88**; trans-Atlan. cable lines * Mar 29; the world's lines, Oct 25; cables, internat. sys., Henniker, 25-**90**

Telegraph

F Inst the writing, Gump, Oct -**88**; cable, Delaney * July, (full) *Sc Am Sup* * Aug 31 * Sep 7-**89**; foreign curs. balancing effects, Fletcher *Inst C E* * v 94 -**88**; sub. cables resist. measurement, Rouillard, abs. v 95 -**89**; sub. Pac. cable, projected *Locom* Nov -**91**; Gill-Alex. indiv. call *R Gaz* * Mar 13; secret service indiv. call * Aug 28-**91**

Sc Am Sup Morse and first line, Feb 25-**88**; trans-atlan. cable lines * Apr 26-**90**; transmiss. of messages through the air without wires, Trowbridge * Feb 21; between Great Brit., Europe, Am. and the East, Niven * Mar 28; first message, Vail, Nov 14-**91**; of to-day, Buckingham *Scribner's* July -**89**

CHINA, and R's, Hitchcock *E News* * Nov 17-**92**

DELANY'S sys. of private line *El Eng* * July 20-**90**; aut. *El Wld* * Feb 2; line adjusting *R Gaz* * Nov 1-**89**

EUROPE, Gov't. tels. of, Rosewater *El Eng* Dec 9, dis. 16; Niven *Sc Am Sup* * Mar 28-**91**

MERCADIER multiplex sys., abs. *Inst C E* v 106 -**91**

PARIS-New York Co. *El Rev Lond* July 29-**92**

PATTEN'S multiplex sys. *El Wld* * Jan 26, (full) * Feb 23, dis. Mar 9-**89**

POSTAL, Brit. Post Office *El Rev Lond* Apr 5-**89**; *El Rev* Dec 5, Gov't. control, Rosewater, dis. (full) 12; Great Brit. sys. *The Eng* * Dec 18-**91**. See also POSTAL telegraph

SPECTRO-tel., Dresing *El Rev Lond*, *El Wld* * July 21 *Sc Am Sup* * Aug 4-**88**

STENOTELEGRAPH, the Cassagnes (stenography at a distance), Chenut *El Wld* * July 19 *Sc Am Sup* * Aug 16-**90**

TYPE printing, Wright & Moore's *El Rev Lond* * Mar 1 *Sc Am Sup* * June 8-**89** *Iron*

WESTERN Union Co., U. S., reports *El Eng* Nov -**88**, Dec -**89**, N. Y. equip. (full) Jan 27-**92**; reports *El Rev* Oct 19-**89**, Oct 22-**92**

WEST Indies, competition map *El Rev Lond* * Dec 26-**90**

Telegraph Engr. Soc. pro. *El Rev Lond* Jan 13-27, Feb 3, 17, 24, Mar 2-16, 30, Apr 20, 27, May 4, 18, 25, June 18; *Eng* May 25-**88**

Telegraphophone, the Wheless *El Wld* * Sep 14-**89**

Telemeter system *El Wld* * Sep 21-**89**; Fiske's (marine dist. instrum.), Brylinski, abs. *Inst C E* v 106 -**91** * *An Telegr* -**91**; Gautier's pocket (rapid dist. measuring), Robbins *Tech Q* * May -**89**

Telephone *El Eng* transmitting speech by interrupted elec. curs., Kintner * Jan *El Rev Lond* * Jan 20, 27; and electric light and power circuits, elec. relations, Lockwood *El Eng* Oct -**88**; interference cases (very full) Mar; induced cur. strength with magneto-teleph. transmitter, Cross, May -**89**

El Eng induction * Jan; eng., Carty, May 21 *El Rev* May 24; spec. induc. capac., Jacques *El Eng* Oct 1-**90**; inductive disturbs. in circuits, Carty * Mar 25, dis. Apr 15 *El Rev Lond* Apr 10 *El Rev* * Mar 28, *El Wld* * 28, dis. * Apr 11 *Sc Am Sup* * May 9, expts., Kennelly *El Eng* * May 6, 13-**91**; signals, selective or indiv., Lockwood * June 8 *El Rev* * June 18 (full) *El Wld* * 11; eng., Webb *El Eng* * Sep 7; connecting stations with exchange office by single line, Zetsche * 21-**92**

El Rev Lond batteries, Pickernell, Oct 19 *El Rev* Sep 15-**88**; telephony, Hibbard *El Rev Lond* Oct 18; induction, Carty * Dec 6, dis. *El Rev* * Nov 30 *El Wld* * 30 *Eng* * Dec 20-**89**; French *El Rev Lond* Jan 10; exchange construct., Pickernell, Oct 17-**90**; receiver, influence of strength of magnet in, Cross * Feb 20; telephoning great cities, Bennett (full) * Sep 4, 11, 11, ed. Oct 2, 16, Nov 13 *Eng* * Sep 11; and telegraphy, prog. in England, Preece *El Rev Lond* Sep 18-**91**; domestic telephs. * May 13-27-**92**

El Rev limits of speaking teleph. lines, Wietlisbach, May 18; Paris exhibit, Sargent, Sep 21, convention, 21; Enzmann's telephonic relay and phonopore * Nov 2-**89**; principles underlying acoustic telephony, Cross, Feb 8; convention (full) Sep 20; Co's corporate organization, Hall, 20; Root's (box) aut. pay station * Nov 22-**90**; the McCluer toll-box * Jan 24; telephony, new method of study, Cross, Feb 7; and telegr., inventors of, Gray addr. Apr 18 *El Wld* 25 *E Mag* June 20 *Sc Am Sup* 20; first exchange, New Haven, Ct. *El Rev* Jan 2; ten years with, Barrett * Feb 20-**92**

El Wld telephony, Touanne, Sep 14-**89**, duplex, Oct 23-**86**, Jan 4-**90**, Barrett * Jan 18; submar. cables for long dist., Preece, Oct 4-**90**; disturbs., Kennelly, Apr 11-**91**; U. S. indus. June 18; Co. operating, Foote, July 9-**92**

E Mag chat with Europe, Webb, Apr -**91**; indus. future, do. Mar -**92**; teleph.-equation, Madsen, abs. *Inst C E* v 95 -**89**; effects, intensity and equality, Mercadier, abs. v 108-**92**; elec. boxes *Sc Am Sup* * Jan 21; interferences of dynamo curs., McCluer, Oct 13-**88**; telephone girl, Nelson, Feb 20-**92**

Telephone

Teck Q magneto transmitter, strength of induced cur., Cross * Feb -**89**; magneto receiver, influence of strength of magnet, do. * Nov -**90**; telephony, studies in Rogers lab. of physics, Mass. Inst. Tech., do. *Soc Arts Mass* -**89**; new method of study in, do. -**91**

ALBANY, Hudson river Co. *El Rev* * Dec 10-**92**

AM. Bell Co., report *El Eng* Apr, decis. May -**88**; reports *El Rev* Apr 7-**88**, Apr 6-**89**, Apr 5-**90**, Apr 11-**91**, Apr 9-**92**; U. S. vs., pat. decis., law (full) *El Wld* Mar 24, 31, (full) *El Rev* Mar 31, May 5 *Sci Am* Nov 24; reports, Apr 7-**88**, Apr 6-**89**, Apr 11-**91**

BELL'S water-jet transmitter, Tunzelmann *El Wld* * Aug 11 *Sc Am Sup* * Sep 8-**88**

BERESFORD, the *El Rev Lond* May 27, June 10-**92**

BOSTON exchange *El Rev* * Aug 1-**91**

COLLIER audible *El Wld* * July 18-**91**

DENVER, induction and interference with service *El Eng* Apr 16 -**90**; system *El Rev* * Feb 9-**89**

DETROIT Exchange Assoc. *El Eng* Sep 17-**90**

EDISON'S carbon pats. *El Rev* * May 14 *El Wld* * 14-**92**

GRAMOPHONE, Berliner *El Eng* * Dec 31-**90** *El Wld* * Jan 3-**91**. See also GRAMOPHONE

HOWARD'S ap. *El Rev* * Oct 31-**91**

JACQUE'S sys. of simul. telegr. and telephony *El Wld* * Nov 17-**88**

LONDON-Paris, Eng. Channel submar. line, Preece *El Rev Lond* * Aug 28; Webb *El Rev* Mar 28, Apr 11, Preece * Sep 26 *El Wld* * Oct 3; *Eng* Mar 20, Preece, Sep 4 *Sc Am Sup* * Oct 3 -**91** *El Eng*

LONG distance, 950 miles, Dickson *Cassier's* * Nov; Webb (full) *El Eng* * May 4, 11; N. Y. - Chic. line, eng. details, Wetzler * Dec 14; 1,000 miles by, N. Y. - Chic., pors. *El Rev* * Oct 29; Neilson *El Wld* July 9; *Sc Am Sup* Jan 9-**92**; *Locom* May -**88** *El Rev*

MICROPHONE, evolution of, Tanner *El Wld* * Dec 13 *El Rev Lond* * Nov 21; transmitter, excursion of electrodes, Cross, Oct 31 *Tech Q* Aug *El Rev* Nov 1-**90** *Tech Q*; Blake contact expts., Patterson *El Rev* May 5 *Tech Q* Feb -**88**; Barrett *El Rev* Mar 19-**92**; transmitter, Berliner pat. (full) *El Wld* * Nov 28, 28-**91**; cur. strength, Sabine, Cross *Tech Q* Feb -**89**. See also MICROPHONE

Telephone, NAT. Exchange Assoc. pro. *El Eng* Oct (full) *El Rev* Sep 15-**88**; *El Rev Lond* June 7-**89**; (full) *El Wld* Sep 15-**88,** Sep 21-**89,** Sep 20-**90**

NEW England Teleph. & Telegr. Co. reports *El Rev* May 18-**89,** May 17-**90**; quarters *El Wld* * Aug 1-**91**

NEW York city, service *El Eng* * Sep 10-**90**; underground wire work *El Rev* * Mar 16-**89**; Met. Exchange * Sep 13-**90,** station *Sci Am* Mar 30-**89**

PHILA. Bell Co. plant (full) *El Eng* * Feb 10, report, Apr 6 -**92**

PULSION, the *Eng* * Dec 6-**89**

ROSEBRUGH duplex system *El Wld* * Jan 4-**90**

SWEDEN & Norway *El Rev Lond* Aug 1 *Eng* Dec 12-**90**

SUTTON'S system *Sc Am Sup* * Feb 28-**91**

SWITCH-board, Vail & Seely's *El Rev* * July 14-**88,** McClure's multiple * Feb 21-**91**; switching, Wordingham, inset *Inst C E* * v 100 -**90**

UNITED Co., an. meeting *El Rev Lond* July 6-**88,** report, June 7-**89**

VAN Size's exchange system *El Wld* * Dec 8-**88**

Tele-photography, Sutton *El Rev Lond* * Nov 7-**90**

Telescope grinding machine, Common's 5-ft. mirror (full) *Eng* * Oct 28 * Nov 4, 11, inset, 18, 25-**92**

Telescopes, hand, for stadia work, Richards *Am Min* * v 20 -**92** *E & Min* * May 14 *Sc Am Sup* * June 11-**92**; object glasses *Sci Am, Eng* * Jan 6; for stellar photog. * Apr 27; astronom., clock driving ap. for, Grubb * Oct 5 *The Eng* Aug 10-**88**; hist., Holden *Sc Am Sup* Jan 21; Manchester exhib. * 28; great, of world, Rees, Mar 3-**88**; pyrometric * Mar 1-**90**; Lick equatorial 36-in., Keeler *The Eng* July 6-**88**

Telpherage, two rope haulage systems, Norris *Am M E* * v 12 -**91** *E & Min* * Aug 8, 15; aerial wire ropeways, Pohlig, inset (full) *Am Min* * v 19 -**91**; cable transfer for R. cars, Spilsbury * v 20 -**92**; and elec. R's of Edinb. exhib., Manville *El Rev Lond* Oct 17-**90**

El Rev elec. transport., Parcelle * Aug 9; double track elevated elec. wire road, for mining and mills *El Wld* * Jan 4-**90**; Sprague elec. aerial tramway *E & Min* * July 28-**88**; Lidgerwood suspen. cableway, Ogden mines, N. J. * Oct 10-**91**

E News the Portelectric carrier, May 25-**89**; Suspen. Transport. Co., Chandler's pat. wire ropeway * July 12-**90**; Plomo-

Telpherage
sas wire ropeway, McIntire * Mar 21 *Sc Am Sup* * Feb 21 *R Rev* the Garrucha aerial, Spain * July 25 *R & Eng* * Aug *Industries;* suspen. cableway at Austin dam, Tex. *E News* * Nov 14-**91**; long span wire rope, Howland, Me. * Apr 2 -**92**

Inst C E Gourjon system wire ropeways, Gros, abs. v 93 -**88** *An Ponts* * v 14 -**87**; Beer system, Raoult, abs. *Inst C E* v 95 -**89** *Rev Mines* v 3 -**88** *Sc Am Sup* * Dec 15-**88**; Ayrton, Perry, Jenkins', at Glynde, England, Fernald *Pop Sci* * July -**90**; wire rope transport. and transmiss. *R Gaz* * Oct 7-**92**

Sc Am Sup Otto pat. wire ropeway (full) * June 22-**89**, Gottesegen coll., Silesia, *The Eng* Dec 28-**88**, inset * Jan 25 * Feb 8, 8-**89**; Ry., elec., Edinb. exhib. * July 11 *Sc Am Sup* * Aug 30-**90**; aerial, Landun sugar works, France * June 13-**91**. See also ELEC., Portelec; ROPE driving; WIRE rope

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Thurston, Robert H., por. *Cassier's* * Nov -**91**

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Timber
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Torpedo boats, the Halpine *El Rev* * Oct 19; Sims-Edison fish * Nov 16; Peral submarine, Webb *El Wld* Oct 19-**89**; Fatum, Italian, inset *Eng* * Jan 20 *Sc Am Sup* * Feb 25; 2d class, Yarrow *Eng* * Apr 27-**88**; Donaldson, Feb 22; Spanish trials report, Mar 29, Apr 12, 19; seaworthiness of, Hovgaard, July 26; Ital. navy * Dec 6; Brit. navy * 20-**89**; Sunderland, b. with petrol. fuel, indic. diags. inset, * Jan 10, Mansel cor. 24, (full) *Sc Am Sup* * Feb 22; Yarrow's, Dec 20 *Eng* * Nov 21-**90**; Brazilian navy, sea-going * Sep 18-**91**

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Torpedoes, the Howell locomotive *The Eng* Aug 17 *Eng* * Jan 20; Berdan system * Feb 3; Grenfell, ed. Apr 27; tor. attack, Jaques, Dec 21-**88**; the Victoria * Aug 29 *Sc Am Sup* * Oct 11; Whitehead & Howell aut., Ellicott *Eng* * Nov 14, 28 * Dec 19, 26-**90** *The Eng* * Aug 7-21; Sims-Edison elec. *Eng* * May 1-**91** *Sc Am Sup* * May 3-**90** * Mar 5-**92** *The Eng* * Dec 18-**91**; Canet, discharge tubes (full) *Sc Am Sup* * Sep 21-**89** *Genie Civil;* marine locom. *The Eng* Feb 24-**88**; the Lege * Apr 12-**89**

Torpedo placing machine, the Fox *R & Eng* * Feb -**92**

Torpedo thrower, aerial, Graydon air gun *Sc Am Sup* * Dec 15-**88**

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Towers

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E Rec water tower, Pullman, Ill. * Dec 28; church spire framing and anchoring * Jan 12-**89**, steeple * Dec 20; London great, designs * May 17, 24, prize * July 5, Shaw's proposed * Aug 23; iron clock tower construct. * Dec 6, prize designs *R & Eng* * Aug -**90**; U. S. Columb. exhib. n *R Gas* Oct 23-**91**; tower of Babel, Kircher *Sci Am Arch ed* June -**88**

Sc Am Sup London great, proposed, designs * June 7, 1250 ft., Davey * July 19-**90**; Proctor steel, U. S. Columb. ex. * Apr 4, oscil. beam, proposed, O. Smith * May 30; Lond. Eiffel, Maxwell & Tuke design, n * Aug 8-**91** *Bld News, Industries;* Lond., designs, 1320 ft. *The Eng* * May 2, 1550 ft., Ende, 1300 ft., Woodcock, Fairfax * 9, 9, 1250 ft., Davey * 23 * June 6, 1400 ft., R. H. Smith report * 29, 1200 ft. Stewart (prize) * 27, 1300 ft., Webster, 2d prize design * July 4, 1300 ft., Graham * Aug 15-**90**. See also CHIMNEYS; MONUMENTS; STANDPIPES

EIFFEL Paris, 1000 ft. *El Wld* * Apr 20; copyright, ed. *Eng* Apr 12; (full) * May 3, compared with Forth br. * 3; elec. plant * June 21; lifts * July 5-19; *E & Min* * Feb 2; inset *E News* * June 8-**89**; *E Rec* * Dec 15-29-**88** * Apr 13 * May 18, 25 * June 1-**89**; pressure gauge, Nansouty, abs. *Inst C E* v 105 -**91** *Genie Civil* * v 18-**91**; lifts, Ansaloni, insets *Inst M E* * July; *R & Eng* Mar; top of *Sci Am* Mar 9; *Sc Am Sup* * Apr 27 * June 15 * July 6, 27; top of *The Eng* * Jan 4-18, hydr. elevators, Roux * Mar 22 * May 10-**89**

Towns, new (boomed), failures in, Fleming *E & Min* * Feb 13, 27, Mar 19, 26, Apr 2, 16, 30, May 21, 28-**92**

Townshend, Richard *Inst C E* v 93 -**88**

Track, railroad, expense of maintenance on wooden and metal ties, Post, dis., insets; English, Tratman, insets *Am C E* * v 18, 18 -**88**, do. and Cunningham dis. v 20 -**89**, imp., Am. development, Tratman, insets (very full) * v 22-**90**, do. Watkins, insets * v 22 *Eng* * June 10 * July 1, 22 * Aug 12 * Sep 23 * Oct 14, 21-**92** *The Eng* * Oct 17; construct. and maintenance, Hall, dis. *Am C E* * v 23 -**90**

Track

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E News the Davies steel lock spike * Apr 19; positive nut-lock, Jeffersonville, O. * Sep 6; maintenance, Reed * Aug 30, Hall, Dec 13; Bush interlocking bolts * 20-**90**; B. & O. standards and rules * Oct 31; rail section, So. Austral. Gov't. R. * 31; spikes, tests of various forms, Cox, Dec 5-**91**

E News Young reversible nut-lock * Apr 16; Haarman (German), bk. review, July 28; protect. against torrents and earth-slides in Sicily, Italy * Sep 15; Prussian St. R's * Nov 17-**92**; German & Austria-Hungary R's per. way, W. Worthington, abs. *Inst C E* v 95 -**89**; double gauge, 3-rail turnouts for, Geddis (full) *R & Eng* * Apr - July -**92**

R Gaz car wheels, axles and, N. E. R. Club dis. Feb 17; per. way, circular returns, Apr 13; mainten. (cost), Goodwin, May 4, Curtis * Nov 16-**88**; stone ballast in India, May 3; Am., English and Indian practice, notes, Oct 11; track work, Nov 8-**89**; Jones safety nut lock, n * Oct 3-**90**; longitud. bearings for, T. C. Clarke, May 29-**91**; N. Y., New Haven standard * Jan 1; tie plates, Sandberg * Mar 25; nut locks * Nov 11-**92**. See also CROSSTIES; R's, curves — spikes — switches — U. S. construct; RAILS, joints — sections

Track jack, the Fisher duplex, n *E News* * Aug 30 *R Gaz* * Sep 5-**90**

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Traction engines, England, descr. and construct., Fletcher *E News* * Oct 27, ed. Nov 10, and steam road rollers, 10, * Dec 1 -**92**; spring wheel *The Eng* Dec 7-**88**. See also ROAD engines; STEAM carriage

Trade, England and Am. relations, McCormick, ed. *Eng* Apr 8-**92**; Am. and foreign exports and imports *E News* Apr 14-**88**

Trade-marks, law of, Sebastian, bk. review *Eng* Dec 19-**90**

Trade schools, N. Y., work in, Mead *E Mag* * Apr -**92**; J. Wilson *F Inst* Feb-Oct; N. Y. *Sc Am Sup* * Dec 20-**90**

Trade unionism, new and old, Howell, bk. rev. *Eng* May 1-**91**

Trade-winds, cause of, Velschow, dis., insets *Am C E* * v 23 -**90**

Tramways, Guinness' brewery, Georghegan *Eng* * Oct 12, insets *Inst M E* * July -**88**; the Hunt industrial *E News* * June 16 -**92**; tramway wagon with steel rails, Wells, descr. *Lehigh Eng J* Apr; steam, for country districts *The Eng* Oct 26, Nov 16-**88**. See also R's. elec; STREET R's.

Trans-Caspian territory. See R's, Trans-Caspian

Travertine deposits, Mammoth Hot Springs, Yellowstone Park, Weed *E & Min* * June 13-**91**

Trellis machine, steel *Eng* * July 25-**90**

Trench brace, Dunn extensible *E News* * July 7-**92**

Trestles, and pile structures, Western Am. R's, inset *Eng* * May 20-**92**; C. B. & N. standard plans *E News* * Apr 7, May 5, June 9; round timber, Burnt Br. creek, Vancouver, Klickitat & Yakima R., Habersham cor. * 9; Norfolk & W. stand. plans * 23; special features in wooden, cor. July 21; design of, ed. 21 -**88**

E News timber, for R's., Palmer, July 13; Cleve. & Canton frame * Nov 2; Wheeling & L. Erie timber * Dec 7-**89**; 24° curve on R., Paddock * May 10-**90**; Can. Pac. designs * May 2-**91**; pile bridges, cost of repairs, Talbot *E Rec* Sep 20-**90**; and scaffolding, Ziegler's sys., com. report *F Inst* * Aug -**88**; R. trestle work, Jameson (full) *R & Eng* * Dec -**89** * Jan -**90**

R Gas safety of pile bridges, Apr 26-**89**; wooden bridges, Foster, Or. & Wash. Ter. R. * Apr 25, Ft. Worth & Den. City stand. * May 30, St. P. & Man. * June 13, 27 July 18 Aug 1, 22 Sep 5, 19 * Oct 31 * Nov 21, 28 * Dec 5, 12-**90** * Jan 2, 30 * Feb 13; Esquimalt & Nanaimo high * Feb 6; Minneap. & St. L. pile and, Hixon cor. * Apr 17; Intercol. R. of Can., deep water * Oct 2; Halifax har. do., pile * Dec 25-**91**. See also BRIDGES, floor-beams and pine stringers, Bates — pile; PILING; PILES

Trickett, John *Inst C E* v 95 -**89**

Trigonometer, Leschorn, diag. *E News* * Nov 24-**88**

Trigonometry, graphical, Foster *E News* * Aug 31-**89**

Triple thermic motor, Haswell *The Eng* June 1-**88**. See also THERMIC motor

Trobe-Bateman, Frederick F. *Inst C E* v 96 -**89**

Trowbridge, William P. *Am M E* v 13 -**92**, por. *E & Min* * Aug 27, por. *Sc Am Sup* * Nov 19-**92**

Trusts, and the law, C. Brown *El Eng* June 25; Am. and English, ed. *Eng* Aug 29-**90**

Tubes and tubing, rolling from solid bars *F Inst* Dec *Locom* Dec *Sc Am Sup* Dec -**90** *Am M E* v 8 -**87**; flexible metallic, Almond * v 12 -**91** *Eng* * Jan 16-**91** *E & Min* * Dec 6 *E News* * Nov 15-**90** *R Gaz* * Nov 15-**89** * Nov 28-**90** *Sc Am Sup* * Jan 10-**91** *The Eng* * Oct 18-**89** * Dec 30-**92**; spirally welded steel, Bayles *Am Min* * v 16 -**88,** v 19 -**91** *E & Min* * Apr 7, 14-**88** *E News* * Mar 30-**89** *F Inst* * Feb -**88,** abs. *R & Eng* * Mar -**89** *Sci Am* June 16-**88** *Sc Am Sup* Nov 8-**90** *Eng*

Eng flexible metallic, Cammell's * Oct 11-**89**; seamless tubes rolling, F. Siemens * Sep 21 *Sc Am Sup* * Nov 10-**88**; the Hartz tube welding machine *E & Min* * June 21; Mannesmann seamless pipe molding proc., Wedding, June 14, Dec 27, weldless, manuf. *E News* * Aug 2 *F Inst* Dec, rolling proc., Siemens *Locom* Dec -**90** * Jan -**91** *Sc Am Sup* * Mar 24 * May 12-**88,** Gordon *The Eng* June 27-**90**

E News manuf. of copper by electricity, Elmore's Aug 9-**90**; spinning, shaping and welding metals, Bevington's proc., com. report *F Inst* * Nov -**91**; spiral weld machin. development, Green, inset * Mar -**92**; manuf., Robertson cor. *The Eng* Sep 28-**88**; tube making machin., Baraclough * Oct 23-**91.** See also PIPES

Tug boats, Kathleen screw, inset *Eng* * Jan 31 *Sc Am Sup* * Mar 8-**90**; Noordzee & Oostzee screw *The Eng* * Sep 2, 9-**92**

Tunnels and tunneling, Rap. Tran. Commiss. report to Mass. Legislature, Apr 5-**92**; ventil of, Eayrs, *E Rec* Feb 28-**91,** dis., insets *Am C E* * v 23-**90**; R., covering ironwork protect. from corrosion, Dagron, dis., inset; method of alignment, Dunham, dis. * v 27, 27 -**92**; R., deep, ed. *Eng* Apr. 10; Transandine R. tunneling plant, inset * Apr 24 * May 22 *R & Eng* * June -**91**; in loose ground, Deacon *Eng* Aug 12-**92**

E Mag mod., Moir * Sep -**91**; building difficulties, Low * May -**92**; cost of tunneling at Hogsback mine, Placer Cty, Cal., Ralston *E & Min* Aug 24-**89**; submar. and Hudson river tun. * May 10; timber, Comstock Co. report, Oct 18-**90**; Reno rap. tran. system, under sts. * Feb 21-**91** *E News* * Feb 27 * Apr 21-**92,** (full) *R Gaz* * June 12-**91**

E News rock, bottom vs. top heading in, Kahnbach * Mar 24; Can. Pac. R., sections, T. Thomson * Nov 24-**88**; suba-

Tunnels

queous rap. tran., diag. * July 19; instrum. for taking cross sections in tun. excavs., Watkins * 26; temp. obs. in, Simplon projected * Nov 1; method, Great No. R., Lond. * Dec 20-**90**; subaqueous, proposed new type, Ford cor. * Apr 11-**91**; tunneling in soft ground, Jan 16, hydr. shields for, proposed, Lee cor. * Mar 19; removal, Caled. R., Scot. * Apr 21-**92**

E Rec Mil. flushing (sewer) * Dec 8-**88**; arch, shield for removing, Caled. R. * May 7; tunneling in loose ground, Vyrnwy aq., Deacon, abs. Aug 27 *The Eng* 19-**92**; ventil., three Alpine, Pürzl, abs. *Inst C E* v 106 -**91**; relining, in use, the Saulzaie, Libeaux, n *R & Eng* * July -**89**; tunneling under heavy pressures, Schenck *R Gaz* * Apr 10 * May 8; ventil. of, ed. Oct 30-**91**. See also BLASTING; EXPLOSIVES; MINES and mining; R's, underground; SEWERAGE and sewers, Brooklyn main relief; WATER-works, N. Y., Croton aq. excav., etc.

ALLEGHENY Portage R. *E News* * June 29-**89**

BALT. Belt Line, York road, inset *E News* * Jan 9 *R Gaz* * Aug 5 *St R J* * Aug -**92**

BALT. & Potomac ventil. plant *E News* * Oct 20-**92**

BETCHWORTH, Dorking, Lond. & Br. R., repairing *E News* * Apr 20, Lopes *Inst C E* * v 95 -**89**

BIG Bull, Norfolk & W. R. *E News* * June 9-**92**

BLACKWALL highway, under Thames river, Lond. *E News* * June 16-**92**

BRAYE, France *E Rec* Jan 10 *R & Eng* Jan -**91**, Laonnois, abs. *Inst C E* v 99 -**90**

CHANNEL. See TUNNELS, English Channel

CHICAGO, sewage, proposed, Nott, cost *E News* Feb 9-**89**; river, cable R., inset * Feb 22, 22 *Sc Am Sup* * Mar 22-**90**; West Chic. st., inset *Eng* * Feb 26-**92**; Wash. st. * Aug 21 *Sc Am Sup* * Sep 19-**91**, alterations in, Tresise *E News* Dec 13; water-works, inset * July 5-**90**

CLYDE river, Glasgow, proposed *Eng* * Jan 17 *E & Min* * Feb 15 *E Rec* * Mar 29 *R & Eng* * Mar *Sc Am Sup* * Mar 15-**90**

COOSA mt., Geo. Cen. R., Dabney cor. *R Gaz* * Aug 3-**88**

CROTON aqueduct, N. Y., surveying on Div. 6, Watkins, dis., insets *Am C E* * v 23 -**90**; excav. through soft ground, Carson *E & Min* * Apr 25-**91**, *The Eng* * Oct 24, 31 * Nov 7-21 -**90**

Tunnels, DULUTH, Minn., report *E Rec* Feb 21-**91**
ENGLISH Channel tubular, proposed, Reed *Eng* Aug 28-**91**; ed. *E News* Oct 25-**90**
GLASGOW, R. covered way, Glas. City and Dist., W. Wilson *E News* * Aug 25-**88**; Glas. harbor *R & Eng* * Oct -**91**. See also TUNS., Clyde
HARLEM river *E News* * Feb 18-**88**
HUDSON river *Eng* Oct 17-**90**; *E News* Oct 5-**89**; shield for * Mar 15 * July 19; segment erector * Nov 15; cast iron lining * Apr 12-**90**, ed. June 16-**92**; *R & Eng* * July; Burr *R Gaz* * Mar 14-**90**; *Industries*
IRISH Channel project, Lethbridge *Eng* Feb 20-**91**; *E News* Nov 22-**90**
KHOJAK, India *E & Min* * July 5, 19 *E News* June 28 *R & Eng* * Sep -**90**
LOCUST mt., Pa., immense mine *E News* Aug 2-**90**
LONDON, City & So. Lond., ed. *Eng* * Nov 7, 7; King's Cross * Dec 5-**90**; Islington deep, City & So. Lond. R. bill, Mar 20-**91**. See also R's, underground, Lond; TUNS., Thames
MERSEY, difficulties *E News* Sep 1-**92**
MEXICO, Valley of *E News* * Aug 10-**89**; Zumpango works * Nov 1-**90**
MILL of Ash, Caled. R. *Eng* * Mar 18-**92**
MILSEBURG, construct., Oberschutte, abs. *Inst C E* v 110 -**92**
MONT Cenis and St. Gothard, data, table *E News* Apr 13 -**89**
NEPEAN, New So. Wales, alignment of, Keele *E News* * Jan 19 -**89**, abs. *Inst C E* * v 92 -**88**
NEW York, Met. R., East river, inset *E News* * Mar 14-**91**. See also TUNS., Hudson river
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ST. Clair, Pa., inset *Eng* * Nov 14 *E & Min* * Dec 6, and ed. (full) *R Gaz* * Sep 26, 26 *Sc Am Sup* * Aug 23-**90**; (Schuyl. Val. R.), Grand Trunk R., proposed *E News* * Jan 26-**89**; L. Huron * Oct 4; shield, inset * Nov 8, 8, 22, inset * Dec 6, hydr. mach. * 20 * 27, tools used for clay excav., eds. * 27 -**90**

Tunnels, ST. Gothard, Switz., and Mont Cenis, data, table *E News* Apr 13-**89**; air of, Bechtle, abs. *Inst C E* v 100 -**90** *Schweiz Baus* v 15 -**90**
ST. Louis water-works *E Rec* * May 7, 21-**92**
SEINE *R & Eng* * May -**91**
SEVERN, Walker, bk. n *Eng* Nov 30-**88**; Richardson *E Rec* June 4, 11, July 2-**92**
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STAMPEDE or Cascade, No. Pac. R., McHenry *E News* * June 30-**88**; Hobart * Oct 3, 10, (full) *Sc Am Sup* * Nov 7-**91**
SURAM, Trans-Caucasus R., Urquhart, inset *Eng* * Apr 5 *E News* May 11-**89**
THAMES, Blackwall, England *E Rec* * May 28, (full details), inset *The Eng* * Mar 18-**92**
VOSBURG, the *Eng* * Apr 6-**88**
VYRNWY aqued., Liverpool *Eng* * June 17, 24 *E Rec* * July 16-30-**92**; arbitration, Sep 19-**91**
WASHINGTON aqueduct *E News* May 4, 11-**89**
WEST Point, Searles, *J Assoc E Socs* Feb *R Gas* Apr 12, abs. *Inst C E* v 96 -**89**
WICKES, Mont. Cen. R. *R Gas* * June 22-**88**
ZIG-Zag, N. Y., Ont. & W. R. *E News* * Jan 10-**91**
ZUMPANGO works, Mex. *E News* * Nov 1-**90**
Turbines (water power), Krainische works, Assling-Sava, Carinthia, inset *The Eng* * Dec 4, insets *Eng* * Aug 28 * Sep 11-**91**; 5,000 h. p. Niag. Falls Power Co., ed., inset * Dec 23-**92**; turbine power, Freeman cor. *E News* Oct 5-**89**
Turnbull, George *Inst C E* v 97 -**89**
Turner, Barrow *Inst C E* v 94 -**88**
Turpentine, and its products, Davies *Sc Am Sup* Aug 17-**89**
Twist drill grinder, Griffith's *The Eng* July 20-**88**
Tyndall, George R. *Inst C E* v 96 -**89**
Type, relative frequency of letters and combinations *E News* July 27-**89**; casting machines, Ross *Pop Sci* Dec -**91**
Type-setting machines, composing and justifying, Lagerman *Eng* * Mar 7-**90**; Crane *E Mag* * Jan -**92**; do they hurt a trade, De Vinne *Sci Am* Apr 20-**89**. See also PRINTING machines
LINOTYPE composing, Mergenthaler's *Eng* * June 28 *E News* * Mar 25-**89** * Apr 21-**92**, com. report, insets *F Inst* * Jan -**90**; N. Y. Tribune *Sci Am* Mar 9; *The Eng* July 12-**89**
ROGER'S Typograph *E & Min* * Dec 6-**90**

Type-setting machines, THORNE, the *E News* * Apr 9-**92**; com. report *F Inst* * May -**90**

Typewriters, Paris exhib. *Eng* Oct 4, 18-**89**; the Maskelyne * Dec 12-**90**; machs. Mar 13; the Yost * May 8; the Gardner * 29-**91**; the Hammond, com. report, inset *F Inst* * Nov -**90**; ribbons (inks), Furst *Sci Am* Nov 24; the Remington, manuf. Dec 15-**88**; the bar lock, Paris exhib. *The Eng* * May 3 -**89**

Typhoid fever, the poison of, Edson (full) *Sc Am Sup* Mar 2-**89**; specific organism of, Fuller *Tech Q* July -**91**

Uline, Andrew B. *El Rev* Apr 16, por. * 23-**92**

United Kingdom. See GREAT Britain

United States of Am., pat. office, Maynard, pors. (full) *El Rev* * Apr 16-30-**92**; indus. prog., ed. *Eng* July 5; navy, Dec 6-**89**; and Can. transport. facils., ed. May 30; coast defences, ed. June 13; McKinley tariff act, eds. Oct 10, 31-**90**; war material in, Jaques, May 22; a transatlantic congress, 29; new tariff regs. Dec 25-**91**

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E & Min (McKinley) tariff bill, abs. Apr 5, law, Nov 1; imports and exports, Aug 16; mint report, Jan 18, precious metals, Leech, bk. rev. June 21, Nov 1-**90**, coinage, Jan 10, Feb 28, Nov 14; exp. and imports, Jan 3; sil. coinage question, Carnegie, July 11, dis. 18, Oct 31 *No Am Rev* June -**91**; Southern indus. prog., Phillips *E & Min* July 9, 16; mint report, Leech, Nov 5-**92**

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Aug 22; fuel supply of, n Dec 12-**91**; mineral stats. '91, ed. Jan 9; McKinley tariff, English views of, Farrer *Forum* Nov -**92**
F Inst Geolog. survey, broader field for Frazer, Sep -**88**; Life-saving service, Piper, Jan *Sc Am Sup* Feb 6; growth of the Federal Power, Nelson *Harper's M* July; families and dwellings, census, Wright *Pop Sci* Aug -**92**; naval prog. *R & Eng* * Jan - Mar * June * July, Sep - Nov; mineral products, Day, Sep -**88**
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The Eng Navy, Oct 30-**91** * Jan 15, 22 * Mar 11, 18, engineers in, July 22-**92**. See also CITIES; COAL; COPPER; COUNTING ap., census; EXHIBS; FORESTS; IRON; LIFE-saving service; MINERALS; NAVIES, U. S.; PAT. system and under names of cities and states and subjects

Units and nomenclature *The Eng* Sep 25-**91**. See also ELEC—MECHAN. units

Utah, So., sulphur deposits, Faber du Faur *Am Min* v 16 -**88**

Vacuum, motors, Paris exhib. *Eng* * June 14-**89**; pan, Manlove * Dec 21 *Sc Am Sup* * Feb 4-**88**; pump, the Beacon, for exhausting incand. elec. lamps *El Eng* * Mar 4-**91**, Berrenberg's do. *El Wld* * Apr 26-**90**. See also PUMPS, vac.

Valve gears, Edward's (launch engine) *Eng* * Dec 30-**92**; Rand's mechan. air *E & Min* * Apr 12-**90**. See ENGINES—LOCOMS — PUMPING engines, valve gears

Valves, details, Nat. W-works Co., Sickels, inset *Am C E* * v 24 -**91**, and air chamber *E Rec* * Sep 19-**91**; Freeman's balanced (engine) *El Wld* * Sep 6-**90**; and hydrant manuf., Chapman V. M'f'g works *E News* * Sep 15-**88**; Rand mechan. air * May 11-**89** *E & Min* * Apr 12-**90**; 24-in. water, loss of head due to, Kuichling *E Rec* Mar 5-**92**; Lunkenheimer Brass Co. novel straightway *R Gaz* * June 6-**90**. See also ENGINES, valves

Vancouver City *Eng* July 12-**89**
Van Depoele, Charles J., pors. *El Eng* * June 25-**90** *El Rev* * Mar 26-**92**
Van Zandt, Ferdinand S., por. *E & Min* * Aug 15-**91**
Vapor engines, and vapors, saturated and superheated, formulas for, properties, De V. Wood *Am M E* * v 10 -**89**, effic. of, do. * v 12 -**91**; volatile, Yarrow *Eng* Apr 6-**88**. See also HOT air engines; STEAM
Varley, Samuel A., por. (full) *El Rev Lond* Sep 9-**92**
Vawser, Robert *Inst C E* v 99 -**90**
Vehicles, draught of, cor. *The Eng* Dec 25-**91**, Brigg * Feb 26, Mar 4-**92**
Velocity, of falling bodies, in water, Richards *Am Min* * v 18 -**90**, insets *Tech Q* * May -**90**; measurement of sound *The Eng* * June 17, Aug 26-**92**
Velocity registering ap., Odograph, Marey *Sc Am Sup* * May 10 -**90**
Venezuela, vs. Great Brit., Bullman *E & Min* Mar 24; coal, asphalt and petrol. deposits *Sc Am Sup* Aug 11-**88**
Ventilation. See HEATING and ventilation
Vibrations, universality of, Haskins *Sc Am Sup* Dec 29-**88**
Vickers, George N. *Inst C E* v 96 -**89**
Victoria, New So. Wales, gold fields *Eng* * Jan 3, 17, 31, Feb 14, 21, Mar 7-**90**; colony *Sc Am Sup* * Oct 26-**89**. See also MINERALS; R's, Victoria
Vignoles, Hutton *Inst C E* v 100 -**90**
Village communities, second summers, Going *E Mag* * Apr -**91**
Vivian, Johnson, por. *E & Min* * May 2-**91**
Voice ap., Piltan's (for studying) *Sc Am Sup* * Feb 11-**88**
Volcanic eruption, Sho-Bandai-San *Sc Am Sup* Jan 12-**89**
Volta, Alessandro, Bell, por. *El Wld* * Sep 5-**91**
Vote counting, elec., Goaziou, abs. *Inst C E* v 92 -**88**
Vulcanizing press, explosion of *Locom* May -**89**

Wadsworth, Marshman E., por. *E & Min* * Nov 28-**91**
Wakeford, John *Inst C E* v 95 -**89**
Walker, Benjamin *Inst C E* v 105 *Inst M E* Apr -**91**
Walker, John, Groves, por. *Cassier's* * Oct -**92**
Walker, Thomas A. *Eng* Nov 29-**89** *Inst C E* v 100 -**90**
Walker, T. U., Mason *F Inst* Nov -**88**
Wallace, David *Inst C E* v 100 -**90**

War, mod., the civilian electrician in, Fiske *El Eng* Oct 29 *El Rev Lond* Nov 14 *El Wld* Nov 1 *E News* * Sep 20, 27 *Sc Am Sup* Sep 20, 27 *El Rev* Nov 1-**90**; electric. in, Parkhurst, Dec 17-31; war 100 years hence, Gautier *E Mag* May -**92**; art of, Mercur, bk. rev. *E & Min* Dec 28-**89**; the Kriegsspiel in Am., Livermore *Soc Arts Mass* -**90**; French disappearing turrets *The Eng* July 20-**88**; H. M. S. Blenheim * July 11; war material, Paris exhib., report * 25-**90**. See also EXPLOSIVES; GUNNERY and armor; MILITARY eng; NAVIES (war ships)

Ward, David *Inst C E* v 93 -**88**

Warden, William M. *Inst C E* v 103 -**91**

Wardlaw, James R. *Am C E* v 26 -**92**

Waring, Charles H. *Inst C E* v 91, 92 -**88**

Waring, Herbert F. *Inst C E* v 95 -**89**

Waring, Thomas *Inst C E* v 104 -**91**

Warships. See NAVIES

Washing machine, Twelvetrees' rotary *The Eng* Feb 3-**88**

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Watch, compens. balance non-mag., Paillard's, Houston *F Inst* * Mar; cleaning and repairing *Sc Am Sup* Sep 22-**88**

Watchman's clock, Eco-magnetic, White *Soc Arts Mass* -**89**

Water, friction waste and loss in mains, Brush, *E Rec* July 14, dis., insets (full) *Am C E* * v 19 -**88**; flow, effect of inc. of supply to a stream, Francis, dis; supplies purity and fresh water algae, Rafter, dis., insets (very full) * v 21, 21 -**89**, abs. *Inst C E* v 101 -**90**; density at different temps., Nagle, diags. *Cassier's* * Sep *Am M E* v 13 -**92**; storage in Ariz., results, Blake; impurities of, A. Hunt *Am Min* v 17, 17 -**89**; flow through pipes *Cassier's* Nov -**91**, Airy *Eng* * Jan 4, 11-**89**, Feb 13 *E Rec* Feb 28-**91**; flowing, util. of energy of, Purdon *El Rev Lond* Aug 12-**92**

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Water

E News evap., depth of, in U. S., map * Dec 29-**88**, Russell, Jan 5; Lond., organic matter in, com. report, Apr 6; self-recording rain gauges, value of, Weston, May 4, 4; wt. of, Dec 28; settlement, Seddon * 28-**89** * Jan 4, clearing by * Feb 1-**90**; consumpt., U. S., and use of meters, Jan 16; flow of in pipes, E. Atkinson, Apr 2; potable, micros. exam. of, Rafter, June 16; nat. aeration, Drown, Aug 25; flow over dam, formula, Frizell * Sep 29-**92**

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Inst C E flow, expts. with submerged ajutages, Clark, abs. v 91; Spree river, changes in passage through Berlin, Frank, abs. v 92; deep waters, penetration of light in, expts., abs. v 94 -**88**; qualities of potable, abs. v 95 -**89**; running, util., Internat. Congress, Paris, '89, Boemches, abs. v 101 -**90**; flow in earthen channels, Sadler, inset * v 103 -**91**

Sc Am Sup Hungary bitter waters, Aug 4-**88**; a glass of water (bacteria in), Kean * Apr 20 *Tech Q* * Feb; water colors, action of light on, W. Russell *Industries*, *Sc Am Sup* July 27 -**89**; molecule, Ganswindt, Oct 3-**91**; wt. of, Jan 25; surface waters (legal definition), Feb 22, Mar 1, 8-**90** *Am Law Rev;* chem. exam. of drinking, Drown *Soc Arts Mass* -**88**; chlorine in normal, Mass. State Bd. of Health map, do. -**91**

Tech Q potable, det. of nitrates in, Grandval & Lajoux's proc., Fox, Sep -**87**; surface waters, odor and color, Drown, Feb; anal., loss of ignition in, do. * Dec; biolog. exam. of, Sedgwick, Oct -**88** *Soc Arts Mass* -**90**; det. of organic nitrogen in, Kjeldahl method, Drown *Tech Q* Feb; number of bacteria in, Jordan, May -**89**, and algae, do., Sedgwick, Feb; carb. acid det. in, Hazen * May -**90**; solids det. in, do. Apr; drinking, alum in test for, E. Richards, July -**91**; difficulty with which

Water
it parts with its dissolved oxygen, Gill, Oct -**92**; supply in So. Africa *The Eng* Jan 20-**88**; induced currents, ed. * Feb 15-**89**; flow through hose and nozzles, see FIRE streams, W-wks.
AQUEDUCTS, the Nadrai, India *Eng* Oct 23 -**91**; of Zempoala, Mex. *E News* * July 7; Croton, bad work on, ed. * Oct 13, 13, McBean, cor. 20-**88**; Kali Nadi, Ganges canal failure report *E Rec* Apr 13-**89**. See also WATER-works
COMPANIES, a London, remarkable hist. *E News* Aug 17; London Co's., n Nov 2-**89**; franchises of, Jan 7-**92**; and consumers, legal relations, Denman *E Rec* Dec 31-**87**. See also under WATER-works
DISTILLING ap., Pamphlett & Ferguson's *The Eng* * Nov 8-**89**
EJECTOR, Miller *E News* * Aug 4-**88**
FILTERS, efficacy of for drinking water, bacteriolog. study, Currier, insets *Am C E* * v 24 -**91**; Hyatt system *Eng* * Nov 9, Long Branch, N. J. *E News* * Oct 13, com. report *F Inst* July -**88**; mechan. filtration, Austen *E Mag* Apr -**91**; expts., Berlin, Frankel & Piefke *E News* June 21, mechan., ed. 21-**90**
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Inst C E filtration, prins. involved in produc. of pure water, Piefke, Berlin water-works, bk. n, abs. v 92 -**88**; softening and filtering ap. for locoms. at Penarth Dock station, Cardiff, Taff Vale R., Pullen, inset * v 97 -**89**; sand filter beds, Piefke, abs. v 102 -**90**, flow water in *An Ponts* Mar -**90**; filtration of natural waters, Drown *Sc Am Sup* Nov 1-**90** *J Assoc E Socs*; Crenothrix, Sedgwick *Soc Arts Mass* -**91**; data of, do. (full) *Tech Q* Nov -**90**; the Torrent filter *The Eng* June 8; revolving, at Dordrecht, 29-**88**. See also WATER purification
GAS. See GAS, water-gas
GATE, the Parker aut. *E News* * July 13-**89**; aut. waste-gate, Foote * June 21-**90**
INDICATORS, water-manometer and anemometer, Silliman *Am Min* * v 17 -**89**; water-level indic. and recorder, Barr & Macwhirten's elec. *Sc Am Sup* * Jan 26-**89** *The Eng* Dec 14-**88**; recorder of quan. and vel. pumped into Alexandra dock, Hull, Hurtzig * Oct 3-**90**

Water METERS, the Venturi, Merriman, dis., Herschel, inset *Am C E* * v 18 -**88** *E News* * July 7-**92** *E Rec* * Nov 10-**88** * June 25-**92**, abs. *Inst C E* v 93 -**88**; waste and loss in mains, Brush, insets *Am C E* * v 19 -**88**; proportional, adapted to measure discharge of nozzles, J. Thomson, dis., inset * v 24; the nozzle as an accurate, Freeman, dis., insets * v 24 -**91**; Schonheyder's positive *The Eng* June 15 *Eng* * 15; Tylor * Sep 21; Bonnas * Dec 7-**88**; Ahrbecker's * Jan 30; Sporton's registering * Dec 18-**91**

E News tests, Boston, Feb 25; Prov., R. I. system, Weston, Aug 11-**88**; the Frost and consumption of water per capita, Feb 9-**89**; who should own the meters, June 21; rates, U. S. and Can., table, ed. Aug 9, 16-**90**; consumpt., U. S. and use of meters, Jan 16-**92**; use of, Tubbs *E Rec* May 23-**91**; rules Madison, Wis., May 21; sale by, Berlin, June 4-30; Thomson proportional * July 30-**92**

Inst C E sale by, in Berlin, Gill, dis. (very full) * v 107 -**92**; elec. ap. for water measuring, Lowe *Soc Arts Mass* -**88**; Tylor's *The Eng* * May 3; the differential positive * May 17-**89**; the Frager * Apr 24-**91**

MOTORS, the 'Demon' *Eng* * Aug 28 *The Eng* * Oct 9-**91**; extended use of, Rodda *E News* Feb 9; and dynamo, the Belknap * June 15-**89**; cost and econ., S. Babcock, Apr 25 *E Rec* May 9-**91**. See also WATER-wheels

PIPES, flow in, Weston, dis., insets (full) *Am C E* * v 22 -**90**; loss of head through 24-in stop valve, Kuichling, insets * v 26 -**92** *E Rec* Oct 8-**92**; cast iron coated, specs., Yardley *Am Min* v 18 -**90**; cleansing, Swiney *Eng* Apr 13-**88**; corrosion, Horsfall cor. Aug 22-**90**

E News action of Boston water on, W. Nichols, Feb 25; Cal. redwood, laying * Apr 28; head in ft. nec. for different vels. of discharge, Brush, July 7-**88**, Gould * Feb 16, 23, Mar 2-23; cement-lined, Feb 16; 6-in. flex. joint * May 18; economic head for long, R. Brown * Oct 5-**89**; welded steel, making, Cartwright proc. Apr 5; cast iron, cost, Weston, tables for es. June 21, 28-**90**

E News tapping branches to, device for * Jan 24; cement-lined, wrt. iron vs. cast iron, 31; cast iron coated, specs., Yardley, com. report * Apr 18 *E Rec* May 9; riveted steel, Duncan (full) * May 9 *E News* * Apr 25 flex. joint, Liverpool * Aug 22, 5-ft., for submerged pipe * Oct 17; large siphon, McKinney

Water PIPES
lake and Miss. river * Nov 28; wooden staves mains, Hawks * June 13-**91**, Apr 28-**88**, May 12-**92**
E News bridge and 48-in main, Wash., D. C. * Feb 13; new method of laying large submerged * Mar 19, lowering submerged, Platte river, Denver * Apr 28; protection crossing bridges, S. Babcock * May 19; distrib. mains and fire service, July 21; cast iron cement joints, May 5 * Sep 8-**92**
E Rec draining and filling, Russell, Dec 24-**87**; arched main over stream, Geneva, N. Y. works * June 6; service pipes discharge, diag. and formula, Prov. * Nov 7-**91**; 4-ft., laying, Brooklyn * Nov 5-**92**; action of water on galv. iron, Nichols *J Assoc E Socs*, abs. *Inst C E* v 92 -**88**; suspended across Sarine river, Friburg, Switz., abs; cast iron, specs., com. report, abs; steel riveted, Duncan, abs. v 107, 107 -**92** *Am W W Assoc* report; 5-ft., Lavergne *Genie Civil* * v 19 -**91**; detection of leaks in, notes, Francis *The Eng* July 13-**88**; tunnel, flex. joint steel pipes, Vyrnwy to Liverpool * June 5-**91**. See also PIPES

POWER, and steam, compar. cost, Manning *Am M E* v 10 -**89**; value of a, Main v 13; prob. in, Richards v 13 -**92** *Cassier's* May -**92** *E News* Jan 24, Dec 5; elec. util. of, Buell *El Eng* Apr 8 *Sc Am Sup* May 16-**91**; Carter *El Rev Lond* * Aug 19 - * Nov 4-**92**; plant at Gokak, India *Eng* * June 8-**88**; expts. on, Aug 28-**91**; in N. Eng., S. Webber *E Mag* * July **91**; computs. worked out by slide rule, Cox *E & Min* Jan 9-**92** *Pwr* * Feb, Mar, June * July * Sep * Dec -**91**
E News of N. Jersey, Cook report, Jan 5; Holyoke, Mass. June 1; Lowell, Mass. 1; Mass. practice, Fitzgerald, May 25, June 16-**89**; Niag. River Co. * May 17, 24, Niag. Falls Co. * Nov 8; Sault Ste. Marie, July 12; elec. light station, Keswick, England, inset * Sep 13-**90**; Austin, Tex. Aug 18-**92**; hydraulics, Hiscox *Sc Am Sup* * Feb 7, 14, 28 * Mar 7, 14 * Apr 25-**91**. See also NIAG. Falls power util.

PRESSURE regulator, the Kieley *E News* * May 4-**89**

PURIFICATION, self-purif. of flowing (biolog. study) Currier, dis., insets *Am C E* * v 24 -**91**; by iron, ed. *Eng* Nov 2-**88**; revolving river purifier, W. Anderson, Aug 21-**91** *E News* Sep 22-**92**; Davis *E Mag* Mar -**92**; contam. of, in storage reservoirs on Pac. coast and palliatives *E News* * Aug 23-**90**; by metallic iron, Devonshire *E Rec* Feb 14 * *Soc Arts Mass* -**91**,

Water PURIFICATION
inset *Tech Q* * Apr -**91** *F Inst* * June -**90**; sep. of iron compounds and removal of sulphuretted hydrogen, Kaeber, abs. *Inst C E* v 92 -**88**; Leeds *Sc Am Sup* Dec 26-**91**; drinking, Austen, Oct 15-**92**. See also WATER filters
SOFTENING, plant, Southampton, inset *Eng* * Mar 11; for locoms. *E News* * June 9-**92**; Davis *Sc Am Sup* June 29-**89**; *The Eng* Feb 3, 10-**88**; Maigneu's ap., Birm. * Aug 22-**90**
SUPPLY. See WATER-works
TOWERS, Yonkers, N. Y. *E News* * May 19-**92**; the Norton, Vyrnwy aqued. * Oct 10 *The Eng* * Sep 18-**91**. See STANDPIPES
VALVES, 24-in stop, loss of head from, Kuichling, dis., insets *Am C E* * v 26 -**92**; 48-in stop, Croton aq. *E News* * Dec 15-**88**; opening indicator, Chapman Valve Co. * Dec 7, new stop valve * 21-**89**. See also VALVES
WASTE, Rochester, N. Y., restricting, Rafter, dis., insets (full) *Am C E* * v 26 -**92**; and prevention, metering and min. rates, Brush *E News* Aug 25-**88**; and charges, various cities *E Rec* Jan 11-25, Feb 1-**90**; and prevention, Hope *Inst C E* * v 110 -**92**
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Water-works

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Wells

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Wood fibre, vulcanized wood-pulp, Deering, abs. *Inst C E* v 92 -**88** *J Assoc E Socs;* woodite, Reed *Sc Am Sup* Mar 31; pulp manuf. in Ger. Oct 13-**88**; cellulose, Sadtler, June 4-**92.** See also LIME sulphite fiber manuf.
Woodhouse, Otway E. *Inst C E* v 91 -**88**
Wood-working, prog. in art of, Tompkins *E Mag* Nov -**92**
Wood wool machine *Sc Am Sup* * Sep 1-**88** *Industries*
Wool and fur (manuf.) W. Smith (full) *Sc Am Sup* * May 11, 18--**89**; woolen goods, causes of insufficient strength in, Feb 15 -**90**
Woolcock, Henry *Inst C E* v 110 -**92**
Workshops, econ. of health in *The Eng* Feb 3-**88**
World's, Columbian exhibition. See EXHIBITIONS, U. S. Columbian
World's industries, U. S. consuls' reports *Sci Am* Mar 30-**89**
Worthington, George, por. *El Rev* * Feb 13-**92**
Wright, Benjamin F. *Inst C E* v 94 -**88**
Wright, George H. *Inst C E* v 102 -**90**
Wright, Robert E. *Inst C E* v 94 -**88**
Wright, Thomas *Inst C E* v 104 -**91**
Wrought iron, defects in. Elbers *E & Min* July 13-**89.** See IRON
Wyld, Robert S. *Inst C E* v 104 -**91**
Wynne, Thomas *Inst C E* v 106 -**91**
Wyoming, Black Hills & Big Horn Cty., resources, Chance *Am Min* v 19-**91**

Yachts, steam, some fast, Werner *Cassier's* * Sep; coast and inland yachting, Pangborn *Century* May -**92**; internat. yacht race *Eng* * July 12-**89**; steam yacht Lady Torfrida * Aug 8-**90**; and strs. comparison, examples, A. Jones * July 3; steam, Princess Alice, 17-**91**; steam, Mira, engine and b's * Mar 18; naphtha aluminum, Mignon * Sep 9-**92**; of N. Y. harbor, Henderson *E Mag* * Mar -**92**

Sc Am Sup racing, deep keel vs. center-bd., compar. merits, Martell, Sep 8 *The Eng* Aug 3-**88**; steam, Ballin *Sc Am Sup* * Jan 10-**91**; yacht design * Jan 2-**92**; steam, Grace Darling, en. & b's *The Eng* Mar 16, 23; steam, Skeandhu and Salem, Sep 21, 21-**88**; twin-screw, 'Ormea,' inset * Apr 12-**89**; steam, Imogen, inset * Oct 3, 3; steam, Am., list, Nov 28-**90**

Yarn weighing machine, aut., Hering *F Inst* Jan -**90**
Yeast, Salamon (very full) *Sc Am Sup* * Jan 5 - Feb 23-**89**
Yellowstone Nat. Park, eng. relations of, Comstock; geolog. hist., Hague *Am Min* * v 16, 16-**88**; *Sc Am Sup* * Sep 15 -**88**; Yosemite and Alaska *Eng* * Sep 30 - Nov 25 * Dec 16, 23-**92**
Yesso, Japan, coasts and rivers of, Meik, inset *Inst C E* * v 102 -**90**
York, John O. *Inst C E* v 94 -**88**
Yosemite, Alaska and the Yellowstone *Eng* * Sep 30 - Nov 25 * Dec 16, 23-**92**
Yucatan, M'Carty *Chautauquan* Oct -**88**; the cradle of man, Ballou *Sc Am Sup* Jan 26-**89**

Zentmayer, J. *F Inst* Dec -**88**
Zinc, Rush Creek district, ark., Chance *Am Min* v 18 -**90**; produc. and prices, '87 *E & Min* Jan 7-**88,** Jan 12-**89,** U. S., '91, Jan 2-**92**; zinc-lead ores, electro-chlor. of, Slater, July 14; det. by titration, Bayley, Sep 1-**88**; Croselmire proc. Feb 9; mining in Ark. * May 11; ores, treatment of complex by smelting, Bartlett, Aug 3-**89**; desilverization expts., Edelmann, Nov 15 -**90,** Roessler, do. Apr 4, May 16; and lead mining, U. S., Kirchhoff, July 11-**91,** det. of zinc in ores, Aug 20-**92**; tensile strength of sheet *Sc Am Sup* Mar 22-**90** *Eng*
Zipernowski-Deri-Blathy, pors. *El Wld* * Apr 16-**92**
Zoology, 100 years ago, Duthiers *Sc Am Sup* Sep 14-**89**

Air navigation, power required, Maxim *Century* Oct -**91**
Aluminum, properties, A. Hunt (full) *Sc Am Sup* May 17-**90**
Chlorine industry *Sc Am Sup* * Sep 6-**90**
Cholera prevention, Sedgwick *Tech Q* Oct -**92**
Douglass, Bryce-, A. D. *Eng* Apr 10-**91**
Electric lighting station, Chic. Edison *El Wld* * Feb 23-**89**
Electric meter, the Teague *Sc Am Sup* * July 18-**91** *El Eng*
Ellipsograph, Yalden *E News* * Nov 17-**92**
Francis, James B., Mills *Tech Q* Oct -**92**
Locomotives, English express, King, diags. *R Gaz* * May 9-**90**
Railroads, Alabama Midland and Ga. So. & Fla., map *E News* * Mar 15-**90**
ALGERIAN *E News* Aug 31-**89**

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